T.G.E. Ventilatori S.r.l.

Socio Unico

USE AND MAINTENANCE MANUAL

Industrial Centrifugal Fans

REVISIONS DIARY

Rev. Nr	Date	Changes made/ Cause of revision
00	30/06/2012	First edition
01	31/01/2014	User manual update

2014

LIST OF ADDITIONS ENCLOSED TO THIS MANUAL:

☐ *SUPPLEMENT FOR ATEX FANS;*

☐ *SUPPLEMENT FOR NON CONVENTIONAL SUPPORTS;*

☐ *SUPPLEMENT FOR NON CONVENTIONAL PULLEYS;*

☐ *SUPPLEMENT FOR NON CONVENTIONAL COUPLINGS;*

☐ *SUPPLEMENT FOR NON CONVENTIONAL TRANSMISSION BELTS.*

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1. INTRODUCTION

Congratulations for choosing a **T.G.E. Ventilatori S.r.l. SOCIO UNICO** fan (hereinafter referred to simply as "T.G.E. Ventilatori S.r.l." or "T.G.E."), as I thank you for having given your preference to our product we inform you that the fan you purchased is designed in conformity with the Machinery Directive 2006/42/EC and comply the statutory and regulatory requirements relating to health and safety. Every part of it is also entirely made of high quality materials and is designed, sized and constructed to ensure proper operation of the machinery over time. Preparing an adequate maintenance program, the fan will always be maintained effectively and efficiently, extending the life of the machinery.

Fans are simple machines and their operation is easily understood, but that does not justify a lowering of the alert level, it does not removes responsibility from those who operates on the machinery and does not grant non-qualified and/or unauthorized personnel the permission to operate on it.

In order to prevent the occurrence of dangerous and potentially harmful situations to operators, machinery and people and everything is in its proximity and the facility itself, **it is strictly recommended to carefully read this manual before setting any intervention on the machinery or part of it**. Should you require more detailed or specific information, it is recommended to contact after sale technical support (ut@tgeventilatori.com) or visit www.tgeventilatori.com

Remember that:

- information given in this instruction manual may not be used for other purposes than those for which it is prepared;
- this publication and the documentation supplied with the fan may not be reproduced in part or entirely without the written permission of **T.G.E. Ventilatori S.r.l.**;
- the content of this manual may be amended by T.G.E. Ventilatori S.r.l. without notice and without incurring any penalty.

1.1 MANUAL PURPOSE

The content of this use and mainteinance manual has been compiled by **T.G.E. Ventilatori S.r.l.** to provide clear and complete information that personnel, **under their own responsibility**, can play in safety: transportation, handling, installation, maintenance, repair, removal and disposal of machinery, of which this manual is part of the standard kit of delivery.

Buyers and designers, for the progress of their work, as well as adopt the rules of good practice, optimal design and refer to the information in this manual can find more information in the "**sales catalogue**" of the product. It should be noted that the non-use and/or not taking into account all the information available, can cause injuries to persons and/or goods, as well as cause economic damage.

1.2 MANUAL RECIPIENTS

All information contained in this owner's manual are intended for **professional users** who must have specific knowledge of how to use the machinery, **must be authorized, instructed and trained**. In particular this manual is intended for:

- *Head of the factory, workshop or work site;*
- *Installations personnel;*
- *Ordinary and extraordinary maintenance personnel;*
- *User.*

The manual must always be kept by the person in charge, in a suitable place, so that it is always available for consultation in the best condition possible.

In case of loss or damage, replacement documentation must be requested from the manufacturer, quoting the name of this manual.

1.3 PERSONNEL QUALIFICATIONS

In order to ensure the highest level of security possible, those who are responsible for the ownership, the manager of the factory, workshop, shipyard, security or anyone for them to unload/handle, install/dismantle, maintain/repair and dispose the machinery must have the following requirements:

- Minimum age for work, with reference to the rules applicable at the time;
- Level of education and training appropriate to the work to be performed;
- Knowledge of what is shown in this manual;
- Knowledge of safety regulations applicable;
- Physical conditions suitable for the work to be performed;
- Possession and use of personal protective equipment (PPE), intact and certificates.

1.4 CLOTHING

The staff responsible for the execution of operations on the machinery, before taking any action, must wear suitable and anti accident clothing, as indicated by the standard 89/686/EEC. The personal safety devices, generically referred as "PPE" (Legislative Decree 81/08 and subsequent) in particular must be in accordance with the Decree 475/92 and subsequent appear intact and in good condition at the time of their use and, if damaged or deteriorated, immediately replaced.

Whenever it is necessary, on the machinery are applied pictograms for remind the use of specific PPE. **Compliance with this requirement constitutes a fundamental condition for the execution of a job safely.**

Specific PPE

With the pictograms shown on the side it is recommended that the operator assigned to perform actions on the machinery should wear one or more of the following personal protective equipment. In order: sound-absorbing headphones, safety shoes, safety gloves, safety goggles, coveralls and protective mask airway.

General recommendations:

Even wearing all law PPE, operate on the machinery, or action on it is never entirely risk-free, so it is always necessary to act when they have sufficient visibility both on areas of work that the area surrounding (although this is not considered immediately dangerous). It is also recommended to never work if you are tired, ill, injured, under the influence of alcohol, drugs or medications that could impair psychomotor performance of the person. Finally, NEVER wear clothing that may give rise to entanglements.

1.5 MANUAL CONTENT

This manual consists of 76 pages and, for ease of reference, has been divided into easily identifiable chapters. **All information contained herein refers to the intended use of the fan as defined below**. Such information shall be for the use and maintenance of the product, as well as its acceptance, transportation, packaging, handling, storage, installation interlocked plants, assembly of separately supplied parts, start-up, operation, shutdown, decommissioning, demolition and disposal.

1.6 MANUFACTURER IDENTIFICATION

T.G.E. VENTILATORI S.r.l. Socio Unico

Factory and Office
Via Francesco Noè 9/11 - 20080 BUBBIANO (MI) Italy
P.I. e C.F. 07060390965

Tel (+39) 02 90848934 ; (+39) 02 90848684 ; (+39) 02 90870894
Fax (+39) 02 90848768

www.tgeventilatori.com

Administrator/Owner
Torrente Gianluca

1.7 MANUFACTURER DECLARATION OF CONFORMITY

For the declaration of conformity, see paragraph 17 of the manual of use and maintenance.

The table below shows the number of T.G.E. Ventilatori S.r.l. machines which can be applied to the recommendations contained in this manual.

FANS		
TYPE	**Impeller minimum diameter [mm]**	**Impeller maximum diameter [mm]**
T 06 P5	*336*	*2500*
T 10 P7	*336*	*2500*
T 10 S7	*310*	*2500*
R l/m/n/p	*281*	*2500*
R q/v/w/x/y	*281*	*2500*
VTA	*313*	*2500*
VTB	*315*	*2500*
VTC	*250*	*2500*
PTA	*310*	*2500*
PTM	*310*	*2500*
PAC	*311*	*2500*
PHR	*280*	*2500*
PHR 3D	*280*	*2500*
PRC	*311*	*2500*
PRC 3D	*311*	*2500*
PRC EVO	*311*	*2500*

Relevant EC Directives applied:	*Machinery directive 2006/42/CE and further variations.*
Applied harmonized standards[1]:	*ISO 281, ISO 1210, ISO 1813, UNI ISO 1940, UNI ISO 10816, UNI ISO 11228, EN ISO 12100-1, EN ISO 12100-2, UNI EN ISO 12499, EN 13463-1, UNI EN ISO 13857, EN 13463-5, ISO 14694, EN 14986,* DIN EN ISO 55474, *EN 60529.*
National standards and technical specifications applied[2]:	*UNI EN ISO 5136, ISO 3744, DIN EN ISO 5801, AMCA STD 210, CEI 17-7, MIL B131G CLASS 1*

[1]

[1] *For a complete list of rules and specifications apply directly to the manufacturer.*
[2] *The national standards and technical specifications are taken if there are no harmonized rules.*

1.8 MACHINERY IDENTIFICATION

In the event that it is necessary to resort to the **T.G.E.** technical service to identify unequivocally the fan, always use data on the nameplate of the machinery.

1.8.1 LOCATION AND STRUCTURE OF THE NAMEPLATE

Depending on the construction and design requirements, the location of the nameplate is not unique, but can assume the positions shown in Figure 1.

A

B

C

Figure 1 ***A****. Standard location for all fans;*
B*. Alternative placement for small fans or for which the space on the fan casing is not sufficient to allow the placement of the nameplate in the standard position;*
C*. Alternative placement for large fans or for which the placement of the plate in the standard position would make the same unreadable.*

There are, however, some exceptions to the cases shown in Figure 1, in particular:

- For fans of small size made in arrangement 9, which are not insulated, in which the nameplate is placed on the free side of the chair;
- For insulated fans made in implementing different from 9, in which the nameplate is located on the right side, under the nameplate of the chair.

Beyond the location, the nameplate of the fan is always made of metal and is attached to the machinery body by rivets or adhesives, Figure 2.

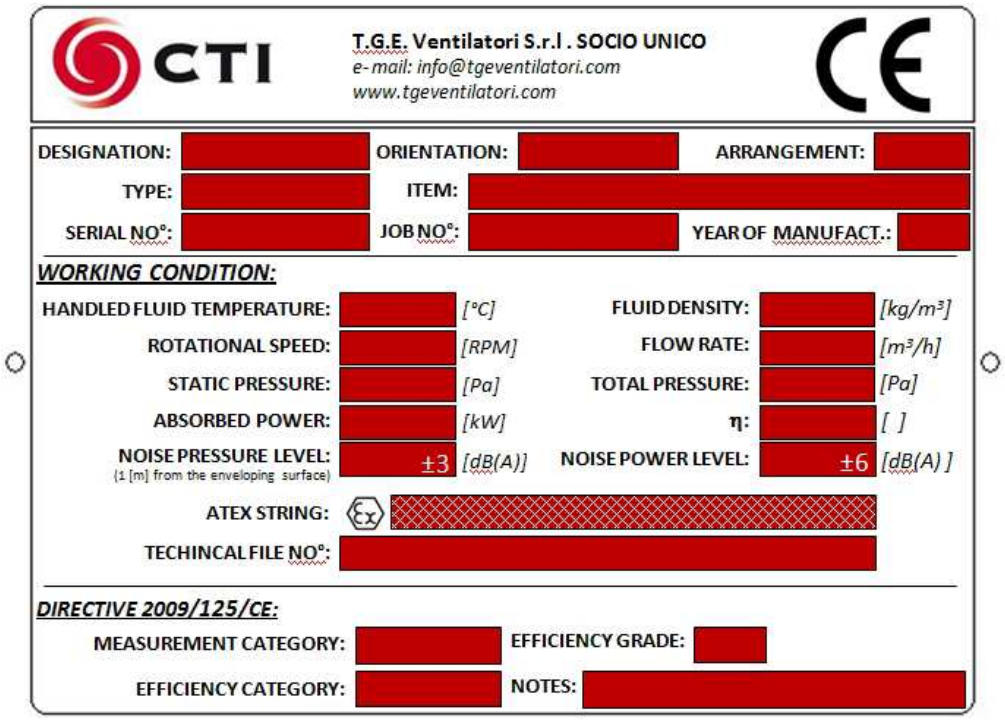


Figure 2 *Nameplate fitted to all T.G.E. fans.*

Engraved on the nameplate are: the references of the producer, the information required to uniquely identify the model of the fan, the basic guidelines for the identification of its operation and information related to the operating conditions of the machinery.

For fans designed to operate in a potentially explosive atmosphere, according to "ATEX" Directive 94/9/EC, the nameplate also shows the "ATEX string". This sequence of characters, preceded by the symbol  (protection against the risk of explosion), used to uniquely identify the group membership of the equipment, the area of use/category (type of protection from the potentially explosive gas or dust) and the temperature class within which the fan can work. **For more information, please refer to the information contained in the supplement of the manual of use and maintenance for ATEX fans.**

1.8.2 NAMEPLATE VISIBILITY, STORAGE AND REPLACEMENT

The nameplate is made with materials that can withstand prolonged action of atmospheric agents and is fixed to the machinery so that it cannot be easily removed. **Nevertheless, the preservation of its intelligibility is borne by the operator/user, which must also ensure that the natural and progressive deterioration does not adversely affect its comprehensibility ever.** If these were to find that the deterioration of the nameplate is likely to impair intelligibility, even in only one of the items of information, is required to request a new one from the manufacturer, referring the data contained in this manual or in the nameplate and provide for mandatory its replacement.

Warning: *For no reason the rating nameplate must be removed or covered. It is also **strictly forbidden and mandatory to affix other plates on the machinery or parts of it without the prior written consent of the manufacturer, under penalty of immediate termination of the guarantee and binding.***

1.9 STANDARD DOCUMENTAL KIT

The documents provided with the fan are:

- **EC declaration of conformity (paragraph 17);**
- **Balancing certificate (paragraph 17);**
- **Instruction manual for installation, use and maintenance.**

1.10 MANUAL UPDATING

This user's manual is in compliance with all applicable laws, guidelines and mandatory rules in force at the date of January 1st, 2014. Its contents reflect the state of the art at the time of placing on the market of machinery, which is an integral and inseparable part.

Possible improvements made to above mentioned machinery, due to new experience and/or knowledge, do not oblige the manufacturer to intervene equipment previously supplied, nor to consider the same and/or the manual lacking or inadequate.

T.G.E. reserves the right to make changes, additions or improvements to the manual, without notifying those who already possesses and, above all, without entailing any act of revenge against T.G.E. Ventilatori S.r.l.

Any additions to the manual, which the manufacturer deems appropriate to send to the users, must be kept with the user manual and maintenance already own.

1.11 IMPORTANT INFORMATION

It is always recommended to use original parts and accessories since, **non-original parts, as well as voiding the warranty on the machinery, can be dangerous and/or reduce the life and performance of the machinery.**

The pictograms and labels that over time should deteriorate or degrade to the point of altering the intelligibility, even in only one of the items of information reported therein, must be restored/replaced by the user, requesting to a faithful copy to the manufacturer (citing data contained in this manual).

WARNING: ***USE AND MAINTENANCE MANUAL IS A STANDARD PART OF THE SUPPLIED FAN AND IT IS AN INTEGRAL AND INDISSOLUBLE PART OF IT (on pain of termination of the guarantee).***
In case of loss and/or damage must ask for a copy to after-sales maintenance citing data on the nameplate of the machinery.

WARNING: *In the event of sale of the equipment to a second user, the primary user is encouraged to inform the manufacturer of the address of the new user so that he can receive any information and/or updates.* ***The sale of the machinery to a second user also provides for the delivery of the manual by the first user, the non-delivery of the manual is automatically void the warranty and void the manufacturer's responsibility regarding the correct use of the same.***

1.12 MEANING OF THE PICTOGRAMS ON THE MACHINERY

On some machines are fixed safety pictograms, divided into prohibition, attention, and obligation.
The meaning of each of them is postponed to the following table.

SIGN	PRESCRIPTION	MEANING
	***Prohibition***	*Do not tamper guards and safety devices*
	***Prohibition***	*Do not clean, lubricate, repair or adjust moving parts*
	***Prohibition***	*Do not follow the cleaning and/or maintenance activities with power applied or machinery while is operation*
	***Warning***	*Rotating organs*
	***Warning***	*Impeller rotation direction*
	***Warning***	*Machinery power parts*
	***Obligation***	*Lift the machinery by grasping this point*

1.13 USER SUGGESTIONS

T.G.E. pursues the philosophy of "continuous improvement" (KAIZEN), so our technical department is at your disposal for advice, recommendations and/or suggestions for improvements intended to make this book more responsive to the needs for which it was prepared.

1.14 GLOSSARY AND TERMINOLOGY

Some terms used in this manual are recurring and therefore hereafter is provided a definition in order to uniquely determine the meaning.

Word	Meaning
Expert maintainer:	An authorized technician selected among those who have the qualifications, skills and training to perform mechanical and electrical repair and maintenance on the machinery.
Ordinary maintenance:	Set of operations required to preserve the functionality and efficiency of machinery. These operations are usually programmed by the manufacturer that defines the necessary skills and methods of intervention.
Extraordinary maintenance:	Set of operations required to preserve the functionality and efficiency of machinery. These operations are not scheduled by the manufacturer and must be performed by an expert maintainer.
Inspection:	All the operations consisting in the replacement of bearings or other mechanical components that show signs of wear such as to affect the operation of the machinery. The inspection shall include verification of all components of the machinery and in case of detection of damage it implies the replacement of the damaged part and the investigation on causes.
Safety measures	Include the following operations: - Disconnecting the machinery from all sources of electric power; - Check the arrest of all moving mechanical parts; - Block all moving parts; - Control of the concentration of dusts/flammable gases and check of the condition of not explosiveness of the atmosphere. - Check the temperature inside and outside of the machinery and check if it is not hot; - Proper lighting of the area surrounding the machinery for the duration of the inspections and routine/extraordinary maintenance; - The personnel operating with the machinery must wear all the necessary Personal Protective Equipment (suitable, certified and intact) including the use of antistatic protective clothing (suitable, certified and intact).

1.15 AFTER-SALES ASSISTANCE SERVICE

T.G.E. Ventilatori S.r.l. after-sales service is able to ensure help, assistance and maintenance everywhere. Our team of skilled technicians, able to intervene promptly throughout the country and internationally, is able to solve any problem related to operation of the machinery, thus minimizing the high costs of downtime.

*In case of need please e-mail us at: ut@*tgeventilatori*.com, please call (+39) 02.90.84.89.34, fax us at (+39) 02.90.84.87.68 or write to T.G.E. Ventilatori S.r.l. (After-sale service) Via Francesco Noé 9/11 - 20080 BUBBIANO (MI) Italy.*

1.16 MANUFACTURER RESPONSIBILITY

The instructions in this manual do not replace, but rather complete the provisions for compliance of current legislation on safety and accident prevention. In any case T.G.E. declines all responsibility in case of:

- Non-compliances with the instructions and use of the machinery other than that provided in this manual;
- Use by staff who have not read and understood the contents of the manual;
- Operations carried out by unauthorized and/or untrained and/or unsuitable personnel;
- Use of machinery in violation of local laws on safety and accident;

- Incorrect installation, lack or incorrect compliance with the instructions provided in this manual;
- Defects of power;
- Changes and/or unauthorized repair;
- Tampering;
- Use of not original or not specific spare-parts.

1.17 MANUAL PICTOGRAMS

Some information contained in this use and maintenance manual are accompanied by pictograms monitors, in order to clarify the importance of the message transmitted from the information. It is, in all respects, the same prohibition signs, care and obligation where one can encounter during normal work activities or not. In order to avoid misinterpretations of the following is in the following table is sent back to the meaning of each of them.

SIGN	PRESCRIPTION	MEANING
	**Warning**	***Generic danger.*** *The operations described in these instructions require that the operator should adhere to what is reported for both his safety and for the safety of those around him and machinery.*
	**Warning**	***Electrocution danger****. The operations described in these instructions exposing the operator to danger of electric shock and/or electrocution as they are related to handling, assembly, disassembly and/or maintenance of parts.*
	**Warning**	***Serious injury danger.*** *The operations described in these instructions exposing the operator to danger of serious damage since they are related to handling, assembly, disassembly and/or maintenance of parts particularly dangerous.*
	**Warning**	***Death danger.*** *The operations described in these instructions exposing the operator to danger of serious injury and/or death can be traced back as handling, assembly, disassembly and/or maintenance of parts particularly dangerous.*
	**Warning**	***Material throwing at a distance.*** *The operations described in these instructions exposing the operator to danger of being hit by passing the material entered or left inside the machinery.*
	**Obligation**	***Generic information.*** *The operations described in these instructions are useful tips for the operations described in the instructions.*
	**Obligation**	***Recycling.*** *The operations described in these instructions or information that accompanied this notice informs the operator about the disposal in a controlled manner in a suitable waste.*

1.18 WARRANTY

To obtain warranty service, the user must follow the instructions as described in this manual.

1.18.1 WARRANTY CONDITIONS

1. T.G.E. Ventilatori S.r.l. warrants that the product sold is free from defects and conforms to the specifications stated.

2. *The warranty period is stated in the contract of purchase and shall run from the date of start-up. The date of receipt must be confirmed by a valid document (e.g. Certificate of goodwill).*

3. *If the user detects a fault on the machinery must give prompt notification in writing to T.G.E. Ventilatori S.r.l., by registered mail with return receipt. T.G.E. Ventilatori S.r.l. may decide, in its sole and absolute discretion, whether to examine the machinery with the user, or give instructions for the return of the same to the factory.*

4. *In the case of functional defects complained of by the user and not reported as such in the process of verification by the technical staff, the intervention will be at full load of the user.*

5. *The warranty only covers the replacement or repair of the defective machinery, with categorical exclusion of any additional or different obligation.*

6. *Notice is hereby given that is not attributable to T.G.E. Ventilatori S.r.l. the defect caused by conditions and/or external events such as, by way of example and without limitation, power surges, incorrect installation and/or maintenance carried out by unauthorized personnel, neglect, inability to use, and poor maintenance by the user or staff of these, than reported and recommended in the user manual. The same applies to the damage caused to the equipment from weather events and natural (lightning, floods, fires, earthquakes, etc..) Or vandalism, or by circumstances that cannot be attributed to manufacturing defects.*

7. *Not covered by warranty: any operations performed to repair problems caused by neglect, accidental breakage, tampering and/or transportation damages (scratches, stamps, dents, etc.. See section 4), interventions/modifications/repairs/maintenance performed by third and/or unauthorized interventions for demonstrations of operation, periodic inspection and maintenance (including cleaning and replacement) and all that at the time of sale had been brought to the attention of the buyer/user.*

8. *The manufacturer's warranty does not operate in the event of defects and/or problems arising from:*

a. *Incorrect configuration/choice;*
b. *Improper installation as different from what is stated in the offer request;*
c. *operation of the machinery with the environmental specifications other than those agreed in the offer request;*
d. *problems resulting from excessive wear of consumable parts;*
e. *improper accessories installation on the machinery;*
f. *technical and quality problems caused by improper use of materials and/or accessories and/or spare parts are compatible and/or non-original;*
g. *Improper maintenance and/or does not comply with precautions for maintenance;*

9. *Are excluded from warranty work regarding the installation of the product in the system and the connection to the electrical power system.*

10. *The guarantee does not cover all external components of the machinery on which the user can intervene during use and/or maintenance or which may be subject to wear.*

11. *In case of improper use of the machinery by the user or the staff thereof, will terminate immediately any form of guarantee.*

12. *T.G.E. Ventilatori S.r.l. will be liable with the user for any damage or indirect, incidental and/or consequential damages, including, without limitation, loss of profits or income.*

13. *T.G.E. Ventilatori S.r.l. disclaims any liability for any damage occurred directly or indirectly, to persons, animals or property as a result of failure to observe all the instructions and warnings regarding installation, use and maintenance of machinery.*

14. *The express terms of this warranty does not in any way authorize the buyer to edit, correct or extend it to its sales network.*

The full list of warranty terms is delivered to the customer in conjunction with the order confirmation.

1.18.2 WARRANTY REGISTRATION

In order to allow the assistance service under warranty, the customer/user must register it by sending the signed registration form contained in Appendix 1 of this manual of use and maintenance, at T.G.E. Ventilatori S.r.l., Via Francesco Noé 9/11-20080 BUBBIANO (MI) Italy.

For further information on the warranty registration, the user can contact the *Service Desk* number from 8.30 to 12.30 and from 13.30 to 17.30 every day except Saturdays Sundays and holidays: (+39) 02.90.84.89.34.

T.G.E. Ventilatori S.r.l. reserves the right to refuse warranty service if the information provided at the time of registration is incomplete and/or inaccurate and/or untrue.

Personal data will be collected, processed and used exclusively for the purpose of registration and will be strictly protected by T.G.E. and used strictly in accordance with the legislation in force concerning the protection of data (Italian Legislative Decree June, 30 2003, n. 196).

1.18.3 WARRANTY CONTROVERSIES

Any dispute which may arise in connection with the validity, the interpretation, execution or termination of these Terms of Guarantee will be the exclusive jurisdiction of the Court in which T.G.E. Ventilatori S.r.l. is incorporated.

2. GENERALITIES

T.G.E. Ventilatori S.r.l. fans are mainly used in industrial and therein largely as handlers of:

- clean air;
- gaseous mixtures with different chemical air composition;
- gases or gaseous mixtures in which are dispersed mists or fumes;
- gaseous or chemically aggressive mixtures;
- gaseous or dusty gas mixtures (variable grain size);
- gases or gaseous mixtures in which filaments are dispersed.

It is established that, depending on the type and composition of the handled fluid and the presence or absence of a phase dispersed in it, the design criteria of the fan changes.

Within that, therefore, each fan **can and should be used only for the specific job for which it was designed** (see section 2.1) and never disconnected from the system in which it was planned its incorporation. If in doubt, always contact T.G.E. after-sale service.

T.G.E. Ventilatori S.r.l. also builds special fans adapted for use in abnormal conditions such as:

- Potentially explosive atmospheres (ranked 1/21 and 2/22 in accordance with ATEX Directive 94/9/EC);
- Environments in which it is necessary to ensure the hygiene conditions/infertility/sterility defined by the H.A.C.C.P. (Italian) standard;
- Atmospheres characterized by habitual and continuous presence of corrosive substances;
- Environments in which it is necessary to ensure compliance with specific limits regarding radiated temperature and noise generated/emitted;
- Handling extremely hot fluids (up to 700 [° C]);
- Very hot and/or humid and/or with high temperature range (-40 ° [C] + 60 [° C]);
- Electrical power supply with frequency of 60 [Hz].

2.1. EXPECTED USE CONDITIONS AND FEATURES

Each T.G.E. Ventilatori S.r.l. machinery has been specifically designed to perform only the functions shown in Table 1.

CAUTION:

Any use other than that indicated, as well as unauthorized, is dangerous. T.G.E. Ventilatori S.r.l. disclaims any and all liability when the objective and subjective are not implemented and complied with the rules of conduct referred to in this manual.

SERIES	CONDITIONS OF USE AND FEATURES	TECHNICAL DRAWING
T 06 P5	Used on all industrial installations for pneumatic transport, chemical industry, boilers and marine industry.	
T 10 P7	Fits in the presence of dust and fumes. Cement-pear and other industrial applications. Chemical industry and shipbuilding.	
T 10 S7	Suitable for all applications on industrial plants, suitable for pneumatic conveying, chemical, fume treatment plants and fireplaces mechanics.	
R l/m/n/p	Suitable for all industrial plants, used in the chemical naval, in thermal power plants and boilers.	
R q/v/w/x/y	Suitable for all industrial plants, used in the chemical naval, in thermal power plants and boilers.	

VTA	Used for all industrial uses for handling of filtered air, pneumatic conveying, chemical industry.	
VTB	Used for all industrial uses for handling of filtered air, pneumatic conveying, chemical industry.	
VTC	Suitable for all applications on industrial plants, suitable for transport with fine grain size of the flue gas treatment plants, mechanical fireplaces and wood industry.	
PTA	Fits in presence of smoke and dust, for cement plants and all industrial uses.	
PTM	Dust transport, handling chipboard, ideal for wood industry, textile, transport of long fibers, paper transport.	
PAC	Ventilation and air conditioning systems for both civil and industrial.	
PHR	Ideal for use in clean air, drying ovens, drying out, brick industry.	
PHR 3D	Ideal for use in clean air, drying ovens, drying out, brick industry.	
PRC	Used for ventilation and air conditioning systems for both civil and industrial, ideal for clean air, drying ovens and in the brick industry.	
PRC 3D	Used for ventilation and air conditioning systems for both civil and industrial, ideal for clean air, drying ovens and in the brick industry.	
PRC EVO	Used for ventilation and air conditioning systems for both civil and industrial, ideal for clean air, drying ovens and in the brick industry.	

Table 1 *Terms of use and characteristics of each T.G.E. Ventilatori S.r.l. fan.*

2.2. NOT PERMITTED USE – NOT INTENDED USE – PREDICTABLE AND/OR UNPREDICTABLE MISUSE

With the exception of the terms and conditions of use set out in Table 1 of Section 2.1, any other use of the fan is deemed not to be, not provided or incorrect and, **therefore, prohibited**.

In conjunction to the above is also prohibited:

1. use in environments that by their nature can result in throwing of material fragments or splinters at distance, without that on the machinery are installed adequate protection system;
2. use in environments that by their nature can result in explosions or detonations, except in the case where the fan is marked ATEX;
3. the use of the device is not allowed to people under the age of 18 years, with reduced physical, sensory or mental capabilities, or lack of experience or knowledge, unless they have been instructed in its use by persons responsible for their safety.

What is reported is a "reasonably foreseeable" list of the possibility of misuse of the machinery, does not exhaust the whole range of possibilities.

3. WARNINGS

Intrinsically safe equipment does not exist, as there is no worker who, through attention, can always avoid the accident. It is recommended to NOT ever underestimate the risks associated with the use and maintenance of the machinery. The user/maintainer is encouraged to always remain focused on the job that is doing. Distractions, low concentration and forgetfulness at work or in compliance with the safety warnings/instructions in this manual and maintenance can cause fire and/or serious injuries.

WARNING

Some safety systems only work with electricity inserted therefore, after turning off the power before you start any work on the machinery, wait at the stop of the march of the impeller.

3.1. ACCIDENT-PREVENTION WARNINGS

Generally:

- ⚠ NEVER use the machinery for anything, in the atmosphere and in conditions not provided for or service other than that provided;
- ⚠ NEVER operate the machinery in an atmosphere not provided for the class of operation;
- ⚠ NEVER modify the function/performance of the machinery or its components in order to increase the potentiality. **Any changes to the fan should be carried out only by personnel authorized by T.G.E. Ventilatori S.r.l.;**
- ⚠ NEVER use the machinery with "flying connections" by means of temporary cables or non-insulated;
- ⚠ NEVER make emergency connections;
- ⚠ NEVER remove safety grids. In the case of absolute necessity to work, take appropriate measures to maintain security and highlights the possible danger. The safety grids must be restore as soon as cease the reasons of the temporary removal;
- ⚠ In case of "Black OUT" immediately disconnect the main switch of the machinery;
- ⚠ NEVER perform any inspections or maintenance on machinery in motion;
- ⚠ NEVER open the inspection door before all rotating parts have stopped;
- ⚠ NEVER try to brake with your hands or other tools rotating parts to speed up the arrest;
- ⚠ NEVER start the machinery before being sure that there are not dangers;
- ⚠ NEVER start the fan if the inspection door has not been replaced and locked in place with its bolts;
- ⚠ NEVER start the fan with free inlet/outlet without having previously fixed the protection grids;
- ⚠ NEVER perform inspections or maintenance on machinery when it is in stand-by mode;
- ⚠ NEVER allow the creation and/or use of the machinery or inexperienced personnel under the age of 18 years;
- ⚠ NEVER modify or tamper the security grids of the machinery;
- ⚠ NEVER perform maintenance, inspections, repairs, or cleaning without having previously turn off the machinery by the main switch and without removing the plug from the electrical distribution system;
- ⚠ To unplug and plug in the power wire, always be sure that the grounding wire is connected at first and disconnected at last;
- ⚠ NEVER perform temporary repairs and or remedial measures that do not comply with these instructions;
- ⚠ NEVER leave the machinery after performing an adjustment without having affixed on it an appropriate hazard warnings and without having informed the department manager;
- ⚠ NEVER leave materials in proximity of parts that can rotate or otherwise set in motion;
- ⚠ Adhere to the rules for accident prevention regulations relating to safety;
- ⚠ The fan must be installed, maintained, dismantled and taken out of service, exclusively by qualified personnel, trained and adequately trained;
- ⚠ Pay close attention to the labels on the fan;
- ⚠ NEVER expose the fan to water jets.

3.2. WARNINGS ON PROTECTIVE EQUIPMENTS INSTALLED ON THE MACHINERY

T.G.E. fans are fitted with accident-prevention accessories in accordance with EN ISO 12499 and in particular:

- free inlet safety grids according to *UNI EN ISO 13857*[1];
- protective casing for pulleys, belts and bearings;
- immediate stop button (on request).

WARNING

In case is expected that the fan works with inlet/outlet (or both) ducted, the user must provide systems able to prohibit access to external items that could damage the inside the machinery. ***T.G.E. Ventilatori S.r.l. disclaims any liability for direct or indirect damages to property or persons, caused by the absence of such safety devices.***

3.3. WARNINGS ON RESIDUAL RISKS

The design phase of the machinery covered by this manual has been accompanied by accurate and careful analysis of the risks to which are exposed to handling, installation and maintenance personnel. Everything is in reference to EN ISO 12100 and made the fan safe and reliable. Still remain some conditions of risk (residual risks), dependent on the type of installation and operating conditions that cannot be previously predicted and for this reason cannot be totally eliminated. Besides this persist residual risks due to wrong behavior, malfunction or events of majeure force. The plant designer and the user of this machinery , in view of increase of internal security standard, have the obligation to draw up its own procedures for prevention (possibly making use of the information in this manual), predict appropriate protection measures (using, where appropriate, what described in this manual) and striving to enforce them.

3.4. PRECAUTIONS FOR USE IN POTENTIALLY EXPLOSIVE ATMOSPHERES (ATEX)

Regarding the warnings of the use and maintenance of machinery designed to operate in potentially explosive atmospheres (ATEX fans), please refer to the **Supplement to use and maintenance manual for ATEX fans.**

3.5 WARNINGS FOR INSTALLATION OF PARTS CHARGED TO THE USER

T.G.E. machinery comes completely assembled. In case it is not, for reasons of space, because it constitutes a spare part or because expressly agreed with T.G.E., strictly adhere to the instructions in paragraph 10.

[1] *TGE Ventilatori S.r.l. sells and sends fans with free impeller (ie without the fan casing and/or fan safety grid on the inlet and outlet) only after direct and explicit indication of the customer as well as following written assurance that he has done a proper analysis of the risks.*
The presence of the safety grid do not completely rule out the possible entry of external items into the fan. If external items or dangerous particles could be mixed with the treated air the analysis of the risks is in charge of the user.
In event that the standard safety grid has not adequate texture to guarantee the minimum safety requirements is responsibility of the user to put in place all necessary precautions to avoid any residual risk.
The aeraulic characteristics indicated in the catalog represent the fan without any accessory. These graphs do not take into account the loss of load due to the safety grids.

4. RECEPTION AND ACCEPTANCE

If the customer has not given precise instructions, the machinery, the documental kit supplied as standard and any attachments are sent according to the T.G.E. Ventilatori S.r.l. internal shipping procedures. The machinery received must be checked and verified no later than the final deadline of two days (48 hours) from the date of receipt (documented by delivery note). Within that period you must make sure that the machinery corresponds to the purchasing order and that both the machinery that the possible accessories, do not show obvious structural lesions or deep abrasions on the paint (everything must be in perfect condition and free of rust, moisture, dents, etc.), that the safety pictograms are the original ones, all present and undamaged, and finally that the documental kit supplied as standard matches the machinery purchased and/or installed.

4.1. DEFECTS AND NON-COMPLIANCE

Ea Each T.G.E. delivery is subjected to a thorough verification procedure to ensure it is complete and in the order when is sent. **T.G.E. Ventilatori S.r.l. assumes no responsibility for it and cannot be considered liable for any damage caused to the machinery, to the documental kit supplied as standard and/or to any accessories caused by the carrier and/or by the transportation.**

The deadline for detect faults, defects and/or nonconformity (all to be documented by photos) is 2 days (48 hours) from the date of receipt (documented by the delivery note) and, subject to the exceptions resulting from agreement signed by both parties, is also the time limit available to the customer and/or user to send any complaint. Complaints must be disclosed to T.G.E. Ventilatori S.r.l. by e -mail, the day immediately following, by registered mail with return receipt containing the explicit notice of **non-acceptance for defect and/or non-compliance in sending.**

In the absence of forwarding within the above peremptory deadline, what will be received will be deemed in full and tacitly rejected and will be excluded any right of the customer/user to ask to T.G.E. Ventilatori S.r.l. damages or compensation, as well ascribe to the same any contractual or extra-contractual liability for any direct or indirect damages to persons and/or property, caused by on mentioned faults, defects and/or nonconformity on the machinery, documental kit supplied as standard and/or accessories.

Any disputes do not exempt the customer/user from the obligation of payment of the amount agreed in the order confirmation.

5. UNPACKING – MOVING – PACKING- SHIPPING

5.1. UNPACKING

To liberate the machinery and/or any of the accessories from their packaging, always proceed with caution, wearing protective gloves and safety shoes (intact and certified).

In sever any cover in polyester film, nylon or PP (with or without aluminum foil) using box cutters, knives or scissors, be careful not to incise/scratch the surface of the equipment/accessory.

Dismembering the wooden crate or the isolated wooden crate, using levers (crowbar), hammers or anything else considered appropriated, be careful not to incise/scratch, not to beat and do not act directly on the surface of the machinery/accessory.

Before lifting the machinery, remove all fasteners that bind the same to possible euro pallets or wooden sleepers on which it is located. In doing it, using levers or hammers carpentry, always pay attention not to incise/scratch the surface of the machinery. Ditto for the accessories delivered on euro pallets or wooden sleepers.

5.1.1 INSTRUCTIONS FOR THE DISPOSAL OF PACKAGING

WASTE DISPOSAL e RICYCLING.

The components of any package are classified as ***normal municipal solid waste*** *can then be* ***disposed of without difficulty****; we recommend that you* ***separate the constituent products*** *(waste separation) for proper recycling, and* ***always adhering strictly to the specific regulations in force in the place of installation.***

T.G.E. Ventilatori S.r.l. does not respond (nor civilly neither criminally) any environmental damage caused by a failure to provide packaging in place or planned by the transfer of the same in inappropriate place.

5.2. MOVING

All handling operations must be carried out with caution and always taking care to avoid falls and bumps machinery/package because it would jeopardize the proper functioning.

By virtue of the fact that the mass, size and shape not always allow manual handling of the machinery/package, it is strongly recommended to use specific equipment for this purpose (forklifts, pallet trucks, bridge cranes, ...) in order to avoid damage to people, things and to the machinery/package itself.

WARNING:

All handling operations including loading and unloading must be carried out by qualified personnel (slingers, forklift, truck operator etc.), authorized and trained.

When load size does not allow enough visibility to the driver or conditions of employment quotas are not such as to ensure adequate safety during handling operations, one or more ground assistants must absolutely help the driver, providing the necessary reports to operate properly and safely. **The safety and security of the people involved in the movements of the machinery/package or close to the areas, in which the operation takes place, is under the responsibility both of the mover than the H&S manager.**

5.2.1 LOADING, UNLOADING AND MANUAL HANDLING OF THE MACHINERY (with or without packing and with or without wooden crate)

If not bulky, less than 25 [kg] (in accordance to UNI ISO 11228), easily graspable or, once grabbed, such that it can be easily handled/transported, if free from sharp corners and/or edges, if placed in a position such that it is not necessary a bending or twisting of the trunk of the body, if the floor does not have inhomogeneities that would result in risk of tripping or slipping and if the floor does not have gradients that involves the handling of the load on different levels, then is possible to upload, unload and manually handle the machinery/package. In this case, the rules to follow are very simple:

- Wear PPE required for the operation (Clothing - Gloves - Boots)
- Squat down in a balanced position, bending the knees and making sure to keep your back straight and stiff arms;

- Grasp the machinery/package with steady grip while keeping your feet wide apart, so as to ensure stability to the body and away from the vertical fall dead weight of the machinery/package, so as to avoid injury in the event of loss of grip;
- When lifting, do not overload the musculoskeletal system, assuming unnatural position and let the lifting stress borne mainly from the lower limbs;
- During transport, keep the machinery/package, near the center of gravity of the body, distributing the weight evenly on the arms, without rocking;
- When depositing on the ground the machinery/package, stoop in a balanced position, bending the knees and making sure to keep your back straight and stiff arms;
- Be sure that your hands and feet are away from the ground machinery/package contact point;
- If the walking had to be especially long and winding, carry out one or more breaks to cool down along the path that leads to your destination;
- Do not drag and never roll the machinery/package on the ground! Not even for short journeys.

	***WARNING:*** *Never lift the machinery from the impeller shaft and/or from blades.*

5.2.2 LOADING, UNLOADING AND MECHANICAL HANDLING OF THE MACHINERY (with or without packing and with or without wooden crate)

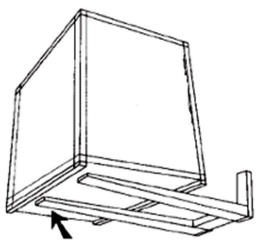
Upon delivery, the fan is always placed on euro pallets or wooden sleepers, so as to be easily loaded, unloaded and moved by forklift, pallet or transpallet. Choosing the characteristics of movement means always take into account the mass to be moved, the gripping points, the center of gravity and the encumbrance. All these data, when necessary, are indicated on the package itself.

In the event that it is necessary to hoist machinery, mandatory use eyebolts, hooks, straps, ropes and so on **certificated and adequate for the load to be lifted**.

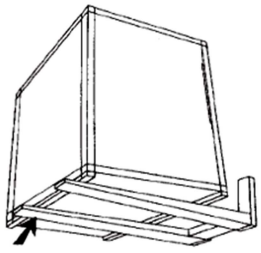
	***The attachment points for hoist the machinery are indicated by the symbol shown on the right.*** *DO NOT USE OTHER GRASPING ITEMS BECAUSE COULD NOT BE SURE AND DAMAGE THE EQUIPMENT.*

The rules to be followed in the handling are very simple:

- Prepare a delimited space and adequate, with paving floor or concrete floor;
- In case the handling operations are carried out by means of forklift manual/electric/motorized, the forks must NOT have a length less than the size of the wooden sleepers or euro pallet on which is positioned the machinery/package itself;



No



Yes

- Keep horizontal the machinery/package and take care to respect the indication of the side that must be maintained upward (in order to avoid the risk of loss of stability and/or rollover and/or damage to the machinery/package);
- Do not drag and never roll the machinery/package on the ground! Not even for short journeys.

5.3. PACKAGING

Before proceeding with the packaging of the fan and/or its accessories carefully evaluate the need to do it. The packaging of the machinery, as well as any of its accessories, is necessary only in a few precise circumstances:

- The shipment unit has a mass greater than 1200 [kg];
- Is to be sent/delivered via ground or air;
- Is to be sent/delivered via water or sea regardless of the country and the climatic conditions of the place of departure and destination.

5.3.1 STANDARD PACKAGING

The standard packing, necessary for transport by road or air, consists of:

- Cover in polyester film, PP or nylon with or without heat sealed aluminum foil;
- Wooden sleepers or euro pallet for transport with forklift;
- Plastic tape (if necessary).

If necessary to ensure construction of a transport frame comprising:

- Wooden crate;
- Wooden panels of insulation fixed to the beams of the cage with nails.

5.3.2 SPECIAL PACKAGING (Barrier Bag)

The standard packing, **necessary for transport by water or sea**, consists of:

- Barrier Bag (compliant with USA MIL B.131.G class 1);
- Hygroscopic salts (according to DIN EN ISO 55474);
- Wooden sleepers or euro pallet for transport with forklift.

If necessary to ensure construction of a transport frame comprising:

- Wooden crate;
- Wooden panels of insulation fixed to the beams of the cage with nails.

5.4. TRANSPORT

If you need to transfer the fan to a different site from that of receipt, always consult a licensed and qualified carrier for transportation and/or shipping, so that the equipment and/or any packages will always be transferred with due care, attention and respect.

In particular:

- In the case of **land transportation**, if deemed necessary, package the machinery/package as described in paragraph 5.3.1 or 5.3.2, otherwise fix machinery/package to the means of transport by lashings and cover everything in so that it appears protected from direct rain from dripping, dust, solar radiation and UV;
- In the case of **sea transportation** the machinery/package should be strictly packed as described in paragraph 5.3.2. The package should then be fixed to the means of transport by lashings and must be placed in the hold or container protected from splashing water, from humid winds and salt.

	***WARNING:*** *Unless otherwise stated, nothing should be placed and/or leaning over the machinery/package transported.* *Never transport the machinery in any position different from that of normal support (land-based).*

6. STORAGE

Short-term storage of the fan may start on receipt of the machinery and continue for a maximum period of 3 months (90 days), provided that all the following conditions are verified:

- All the conditions set out in paragraph 4 - Receipt and Acceptance – are confirmed
- The machinery has been freed from any packaging;
- The machinery and/or the spare parts are positioned on pallets and away from working machinery and/or sources of vibration;
- Nothing is placed over the machinery, the documental kit supplied as standard and/or any accessories;
- The environment or the storage room in which the machinery, documental kit supplied as standard, (if any) accessories are lying is closed, with temperatures between -5 [°C] and +40 [°C], and with a relative humidity not exceeding 80%.
- In the room are not stored chemically aggressive agents (to whatever extent and in whatever degree aggression);
- The machinery is protected from direct sunlight and/or UV.

USEFUL INFORMATION:

In order to preserve the characteristics of resistance of the components of the machinery, and in particular the impeller, it is advisable to shield the windows of the local storage with a high-pass optical filter tuned to the wavelength of 590 [nm];

Periods of storage between 3 and 12 months (365 days) or outdoors, require specific procedures that are provided only at the direct request from the manufacturer.

During all the storage period must be:

- Kept closed the fan inlet and outlet ;
- Kept covered bearings, seals, drive shaft and the motor, in order to avoid harmful buildup of dust;
- Lubricate monthly mechanical organs to protect them from corrosion and/or rust;
- check monthly the position and the tightness of locking pins and of shipping plug;
- Manually rotate the impeller on a monthly basis.

7. INSTALLATION AND LINKS

All installation steps must be considered since the preliminary design because the fan installation modes vary with its type, size, mass and the specific requirements of operation into the assembly site. In particular, the site manager, before proceed with the installation of the machinery must:

- Draw up a security plan (to protect the safety of persons directly involved in the installation operations) that takes into account all existing laws relating to the prevention of accidents in the workplace;
- Ascertain that all what is been reported in the safety plan is always strictly abided.

WARNING:

It is forbidden to proceed with commissioning without having looked over the proper integrity of the machinery. It is also forbidden to assemble/disassemble/reassemble without including all the details defined by the manufacturer.

Apart from the intrinsic and extrinsic, every fan must always be installed in the position agreed in the RFP, and so that this proves to be constantly fixed firmly to its foundation or base of support or support.

WARNING:

When installation is complete, all around the machinery, must remain enough space to allow operators perform normal operations as: assembly, disassembly, cleaning, inspection and maintenance.

n order to prevent the transmission of noise due to structural always connect the machinery to the aeraulic system through damping joint and/or flexible connection.

7.1. INSTALLATION ON A FOUNDATION

The best basis on which install the fans are "reinforced concrete foundations", well aggregated, leveled and dried, provided that they have a mass greater than the sum of the mass of the electric motor mounted on the fan plus four times the mass of the fan motor assembly.

Fixing the machinery to its basis, it is recommended to equip bolts with rubber spacers. In order that the spacers can perform their function well it is necessary that these do not result completely crushed.

WARNING:

Improper mounting and/or incorrect installation of the machinery affects its performance and creates a dangerous situation both for the machinery than for the interlocked system.

WARNING – RISK OF SERIOUS INJURY AND/OR DEATH:

By installing the fan with free inlet/outlet is necessary:

- *Install safety grids in accordance with the UNI EN ISO 12499;*
- *Observe safety distances in accordance with DIN EN ISO 13857.*

Keep in mind that:

- *With high prevalence, clothing (or parts), limbs or, in the worst case and/or with big machines, whole bodies could be sucked into the fan;*
- *any item ingested by the machinery may be projected at distance by the impeller and cause serious injury to persons or damage to property.*

7.2. INSTALLATION ON A METAL SUPPORTING STRUCTURE

In order that a steel structure proves suitable for the installation of a fan is necessary that it is able to support the weight of the fan and the dynamic forces generated both by the electric motor, that by the rotation of the impeller. In order to avoid problems related to phenomena of harmonic excitation (resonance) it is necessary that the first characteristic frequency of the support structure is 50% higher than the impeller speed and/or the motor.

Fixing the machinery to its basis, it is recommended to equip bolts with rubber spacers. In order that the spacers can perform their function well it is necessary that these do not result completely crushed.

	***WARNING:*** *Improper mounting and/or incorrect installation of the machinery affects its performance and creates a dangerous situation both for the machinery than for the interlocked system.*
	***WARNING – RISK OF SERIOUS INJURY AND/OR DEATH:*** *By installing the fan with free inlet/outlet is necessary:* – *Install safety grids in accordance with the UNI EN ISO 12499;* – *Observe safety distances in accordance with DIN EN ISO 13857.* *Keep in mind that:* – *With high prevalence, clothing (or parts), limbs or, in the worst case and/or with big machines, whole bodies could be sucked into the fan;* – *any item ingested by the machinery may be projected at distance by the impeller and cause serious injury to persons or damage to property.*

7.2.1 TIGHTENING COUPLES

The tightening of bolts/nuts with metric threads, must be done applying of torque (or torque) generated by a torque wrench. The final value of the torque wrench must be achieved gradually and with an operating sequence consisting of at least 7 steps. For the maximum values of torques in relation to bolts/nuts size, please refer to **EN 14399** and the (Italian) DM January 14, 2008 "Technical standards for construction" Higher Council of Public Works, February 2, 2009 Circular no. 617 that reflects the contents of the **CNR-UNI 10011** (Italian) standards.

7.3. ELECTRICAL CONNECTION

The electrical connection of the fan to the electrical distribution line (**electrical board control – EBC**-, plug and grounding) comply with current regulations regarding electrical safety is the sole responsibility of the customer/user.

	***CAUTION - RISK OF ELECTRIC SHOCK*** *The electrical connection must always be performed by specialized personnel who have suitable theoretical and technical trainings.*
	***WARNING:*** *Improper wiring may severely damage the electrical board control and the driving motor.*

Before proceed with the electrical wiring verify that:

- The power cables in the path: EBC – motor – EBC, has area that can withstand the electrical power required by the electrical driving motor;
- The line is disconnected and/or grounded;
- The EBC is off, accompanied by monitory sign "does not reactivate the line, staff at work" and equipped with system to prevent erroneous ignition.

It should be noted that:

- Fans driven by electric motors with power less than 5.5 [kW] can be directly started;
- Fans driven by electric motors with power exceeding 5.5 [kW] must be started with a "light start" using star-delta configuration, soft starter or inverter;
- When the driving electric motor has high power and/or its working cycle presupposes repeated start-up hourly/daily, is necessary to insert a power factor corrector;
- It is necessary to protect the motor/EBC via appropriate fuses calibrated to match the actual starting time of the machinery, the inrush current and full load current.

The electrical motor wiring (single and three phases) to the electrical distribution line is accomplished via the motor terminal box, Figure 3.

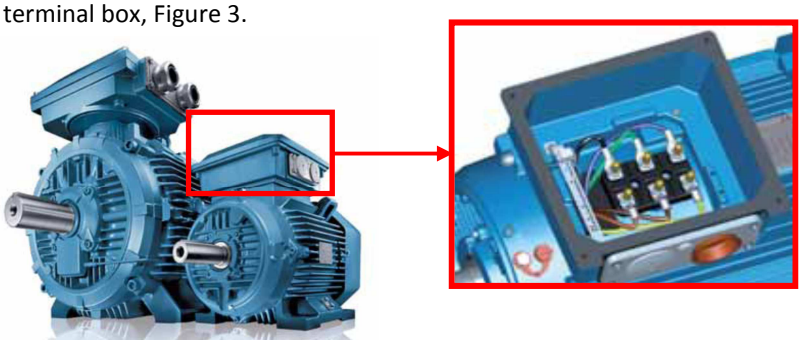


Figure 3 *Location and contents of the clip of a three phase electric motor.*

T.G.E. fans, except in rare cases, are driven by three phase electric motor. Depending on the supply voltage and independently of the supply frequency, the positioning of jumpers on the motor terminal box changes and how they do it is shown in Figure 4.

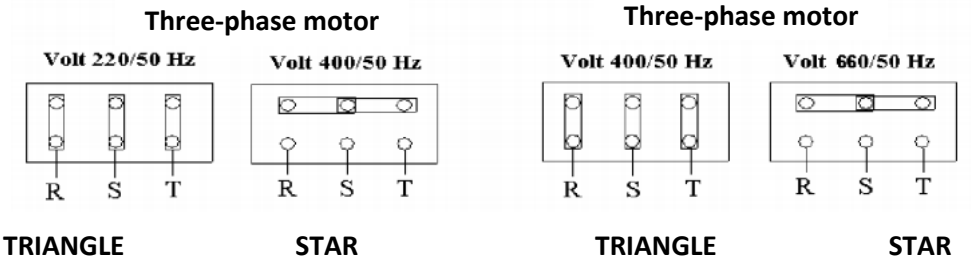


Figure 4 *Jumper connections inside the motor terminal box.*

	***WARNING:*** *All electrical connections must be carried out in such a way that you can not get her in any way.*
	***WARNING:*** *Before connecting the electric motor and especially before you start, always check that the data plate (voltage and frequency) are consistent with those of the electrical system to which it will be/has been connected.*

During the work may occur temporary alterations in the losses of load of the system (for example as a result of opening/closing of valves and/or branch circuits), these imbalances will almost always result in mechanical imbalances (in fact we need more/less power to meet the changing requirements of the system). Except for the case in which the working point of the fan is located in a zone of unstable equilibrium of the performance curve or at the extreme left/right of the same, the electric motor automatically will try to compensate the increase/decrease of the electric load (autostability properties of the system). To avoid that the automatic balancing action of the motor leads to a rapid degradation of the stator windings with consequent damage to the motor itself, it is necessary to control the mechanical imbalances, then electrical imbalances, via ordinary thermal relay.

WARNING:

*According to (Italian) standard **CEI 17-7** on all three-phase motors, it is essential to use a differential **thermal relays** sensitive to the phase difference.*

For sizing the breaker, remind that:

- In the case of direct start, the peak current can reach 6.5 times the rated current;
- In case of start with star/delta configuration the absorption is limited to 2.2 times the rated current. In particular, in the transition from star to delta, causes an absorption peak current equal to 4.5 times the rated current.

In the case in which the driving motor is controlled by a VFD (Inverter), always remember to insert on the phases a PTC thermistor for protection against overheating.

In case of single-phase driving motor or other (internal combustion - hydraulic) for the wiring and the connection instructions, always refer to the information contained in the supplement to **use and maintenance manual for NON CONVENTIONAL DRIVES.**

7.4. CONNECTION TO THE AERAULIC SYSTEM

The connection of the fan to the aeraulic system is accomplished by tightening the bolts between the duct flange and the inlet and/or outlet counter/flanges. (for the maximum values of torques ref. Paragraph 7.2.1).

USEFUL INFORMATION:

To reduce fan-borne noise structurally transmitted to the aeraulic system is recommended to always use anti-vibration joints.

In order to not compromise the integrity of the flexible connections, once the connection is completed, flexible joint should not be tense.

Ducts should not ever become a burden to the fan, then use support brackets.

To increase the tightness of flanged fittings it is always recommended to use seals, adhesives and sealants.

7.5. MINIMUM CLEARANCES

The distance between the rotating parts of the impeller and the not moving parts of the fan must always be equal to 1% of the diameter of possible contact and never lower than 2 [mm] or greater than 20 [mm]. These distances are to be considered both in radial and axial direction. The seals are not subject to such action.

8. FIRST START – START UP – OUT OF SERVICE

8.1. FIRST START

The first start is used to verify if the impeller direction of rotation (indicated by appropriate pictogram) is correct and if all electrical wiring made, have been made regularly.

USEFUL INFORMATION:

If possible it is advisable to start the machinery with damper or shutter completely closed, since this significantly reduces the absorbed motor power and thus the risk of electrical overload.

What was said can be reduced in two actions:

- Shutting off on the EBP of the line headed to the fan driving motor;
- Check of the correct direction of rotation of the impeller or check the correct flow direction.

WARNING:

The start-up time length must be proportionate both to the need of checking the direction of rotation of the impeller that the need not to compromise the operation of the driving motor. ***No more information can be provided about the maximum number of starts per hour because this parameter is strongly influenced by exogenous factors such as: the driving motor power, the RPM of the impeller, the impeller PD2, installation conditions, the characteristics of turbulent fluid flow of the gaseous mixture, etc. Good practice, however, is NEVER extend the first start more than 15 seconds and never repeat that before 15 minutes have passed from the previous start-up.***

If is found that the impeller direction of rotation is wrong then:

- Proceed to the electrical isolation of the machinery and of the corresponding electrical line;
- Only after having completed successfully what previously said, perform the reversal of two of the three phases in the motor terminal box (for single-phase motors the reversing of the direction of rotation is obtained by swapping the internal connectors, as described on the nameplate of the motor or the wiring diagram).

Once completed, and just for verification, restore the general safety and redo all the actions related to the initial start-up.

8.1.1 CHECK OF CURRENT CONSUMPTION

Once reached the machinery nominal speed immediately measure the current consumption and compare it with the nominal current indicated on the motor nameplate. **In case of anomalous current absorption, immediately disconnect the power supply of the electric motor.**

8.1.2 CKECK OF BEARINGS TEMPERATURE

The SKF standard bearings in hardened steel, depending on the type and of used lubricant have a maximum recommended operating temperature range of 70 [°C] to 120 [°C]. Within what has been said, in a fan in full operativity, the operating temperature of the bearing should never exceed these limits (for more information read the data sheet on the SKF bearing installed).

Surface temperature over the stated limits, are a symptom of malfunction. Possible causes could be:

- Lubricant exhausted;
- Lubricant present in not sufficient or excessive quantities;
- Lubricant improperly selected/chosen for the application;
- Lubricant not compatible with the one already existing within the bearing;
- Wear;
- Excessive dynamic load (vibration);
- Excessive temperature of the fluid handled by the impeller (heat conduction);
- Accumulation of dust and/or deposits on the bearing.

8.1.3 VIBRATIONS CHECK

Fans are rotating mechanical machinery then inevitably and inherently suffer of problems related to vibration. The latter are due largely to the unbalance of the impeller and/or of the other elements that compose the rotating machinery. In order to prevent fatigue damages all rotating parts are statically and dynamically balanced (referring standard for impellers ISO 1940 - balancing grade 6.3[3]).

WARNING:

During start-up transient of the machinery may occur oscillatory motions of reaction. These motions are temporary vibrations that are exhausted after a short time. If this is not, the stop of the machinery and immediately contact T.G.E. Ventilatori S.r.l. service after sales support.

For fans in arrangement 1, 8, 9 or 10[2], the vibration measurement should always be performed with respect to the three principal directions (horizontal, vertical and axial) **of each bearing or Monobloc**.

For fans in arrangement 4 and 5[6] vibration measurement should always be performed out with respect to the three principal directions of the motor.

USEFUL INFORMATION:

The vibration levels of the fans can be monitored through the installation of accelerometers on the bearing housings.

The maximum permissible speed in relation of the load bearing surface and the risk condition are given in table 2.

RISK CONDITION	RIGID MOUNT [mm/s] or [RMS]	FLEXIBLE MOUNT [mm/s] or [RMS]
NORMAL	4,5	6,3
ALARM	7,1	11,8
STOP	9,0	12,5

Table 2 *Maximum allowable vibration.*

WARNING:

If the speed of vibration in one of the three principal directions of the bearings were to reach and/or exceed the threshold values, STOP immediately the fan and contact T.G.E. Ventilatori S.r.l. after sales service.

8.2. CHECK FOR REGULAR OPERATION

The smooth operation of the fan is pointed out by:

- The absence of irregular oscillatory movements both periodic that continuous;
- Vibration magnitude not higher than those reported for the specific product category according to UNI ISO 10816 and ISO 14694. (a maximum RMS value of vibration over 4.5 [mm/s] is not allowed);
- No pings or by rubbing from the fan casing and/or the bearings;
- Absence of parts of the machinery at temperatures higher than those provided as for ordinary operation under normal operating conditions.

Most of the failures that may occur during the first period of operation (**break-in**), are due to loosening of the fixation, particularly as a result of the fact that, during this period, occurs a general settlement of all rotating parts and not, as well as of the related mechanical and electrical connections.

In order to prevent potentially catastrophic events is **therefore ESSENTIAL after 1 hour of operation stop the fan and perform a general inspection of the machinery with the utmost accuracy. In particular, it is essential to check the tightness of all bolts and, where appropriate, provide for their new tightening** (see section 7.3 for tightening torques).

If the fan is driven by transmission belt**, it is essential after 1 hour of operation, stop the fan and perform a general inspection that includes, in addition to the bolts, even the drive belts**. As far as the latter is essential to check their status and their tension providing, if necessary, to their replacing and/or their re-tensioning (See section 10.8).

WARNING:

Regardless of the mode of motion transmission, all mentioned above must be repeated again after 3-4 days of continuous work.

8.3. COMMISSIONING

The commissioning of the fan is expected to be annotated on the MACHINERY REGISTER OF COMMISSIONING with all the controls with below stated:

STOPPED MACHINERY CHECKS:

- Check of the CLEARANCE (Impeller – inlet cone – fan casing – belts carter –bearings – shaft ...);
- Check of ENVIRONMENTAL DATA and compliance with the limits of use of the machinery;
- Check of the BEARINGS CONDITIONS;
- Check of the BEARINGS LUBRICATION CONDITIONS;
- Check of the CORRECT GROUNDING of the machinery.

WORKING MACHINERY CHECKS:

- Check the SPEED OF ROTATION both the motor and the impeller and compliance with the values indicated on the fan/motor nameplate;
- Check of the VIBRATIONS in accordance with the relevant regulations for the specific product category;
- Check of the BEARING TEMPERATURE;
- Check of the SURFACE TEMPERATURE OF steady machinery;
- Check of AERAULIC PERFORMANCE of the machinery;
- Check of the NOISE LEVEL and of the compliance with environmental impact as defined in the risk analysis done at the beginning of the project;
- Check the VOLTAGE, CURRENT AND ABSORBED POWER OF THE MOTOR and check of the compliance with the nameplate data.

WARNING:

The final unit can not be put into service until when it has not been declared in situ, complying with the Directive 2006/42/EC.

8.3.1 BREAK-IN

Every T.G.E. fan has a run-in period of working 150 hours. During this time, it is advisable not to put the machinery in working conditions particularly critical: working temperatures higher or lower than the design, "over run", repeated cycles of stopping and starting (even if compatible with the maximum number of sustainable starts per hour by the motor).

8.3.2 CHECKS DURING OPERATION

The checks to be performed during the work life of the machinery depend on the concentration of the particles and/or airborne filaments in the fluid handled by the impeller. The repetition intervals are approximate as influenced by many factors (history of the machinery and maintenance, mechanical wear, nature and fineness of the dust/airborne filaments, concentration and its variability ...) and can be divided roughly as follows:

- **10,000** hours of operation in case of **clean fluid;**
- **8,200** hours of operation in case of **weakly dusty fluid;**
- **6,300** hours of operation in case of **moderately dusty fluid;**
- **4,300** hours of operation in case of a **dusty fluid;**
- **2,000** hours of operation in case of **extremely dusty fluid;**

At each repetition interval, check:

STOPPED MACHINERY CHECKS:

- Check of the CLEARANCE (Impeller – inlet cone – fan casing – belts carter –bearings – shaft ...);
- Check of ENVIRONMENTAL DATA and compliance with the limits of use of the machinery;
- Check of the BEARINGS CONDITIONS;
- Check of the BEARINGS LUBRICATION CONDITIONS;
- Check of the CORRECT GROUNDING of the machinery.

WORKING MACHINERY CHECKS:

- Check the SPEED OF ROTATION both the motor and the impeller and compliance with the values indicated on the fan/motor nameplate;
- Check of the VIBRATIONS in accordance with the relevant regulations for the specific product category;
- Check of the BEARING TEMPERATURE;
- Check of the SURFACE TEMPERATURE OF steady machinery;
- Check of AERAULIC PERFORMANCE of the machinery;
- Check of the NOISE LEVEL and of the compliance with environmental impact as defined in the risk analysis done at the beginning of the project;
- Check the VOLTAGE, CURRENT AND ABSORBED POWER OF THE MOTOR and check of the compliance with the nameplate data.

8.4. OUT OF SERVICE – DEMOLITION - DISPOSAL

At the end of life or in case of replacement by other equipment, the fan used/to be replaced must be decommissioned, demolished and properly disposed for the recovery and recycling of the materials.

8.4.1 OUT OF SERVICE

The decommissioning of the machinery consists of three simple linear operations: ELECTRICAL DISCONNECTION, MECHANICAL DISCONNECTION and HANDLING.

	***WARNING:*** *As all operations on the machinery also the decommissioning is not without its risks, therefore caution is advised in its execution.*
	*During the operations of decommissioning is always recommended to wear overalls, safety shoes, safety gloves and a mask to protect the respiratory from dust.*

Before start any operation write down date and time of the decommissioning on the REGISTER OF THE MACHINERY as well as the operation manager.

ELECTRICAL DISCONNECTION

- Disconnect the machinery power supply from the EBC and wait until the impeller, motor and all other moving parts have stopped.
- Secure the area surrounding the workplace.
- Proceed to disconnect the wiring from the motor terminal.

MECHANICAL DISCONNECTION

- Unplug the machinery from the aeraulic duct (see Section 7.5);

	***WARNING:*** *During this phase dust deposited and accumulated on the machinery over time and during work may blown in to air, carry therefore mask for respiratory protection (**risk of suffocation**)*

- Untying the fan from the support structure on which it is located (see paragraph 7).

HANDLING

- Move the fan according to the procedure outlined in section 5.2;
- Put the machinery in a safe place and inaccessible to non-specialists waiting to proceed with the demolition and dismantling.

8.4.2 DEMOLITION

Before disposing the fan is necessary to demolish/dismantle the machinery and in particular:

- Separate plastic and/or rubber parts;
- Separate metal parts (steel - aluminum - copper);
- Separate electrical and electronic equipment;
- Recover any exhausted lubricants;

These operations can be performed by the customer/user or delegated to companies specialize in the dismantling of machines.

8.4.3 DISPOSAL

It is recommended not abandon the machinery and/or its parts in to the environment, but always take care of their transfer to a safe place and suitable for disposal.

WASTE DISPOSAL and RECYCLING.

All materials referred to in paragraph 8.4.2 can be recycled and reintroduced into the production cycle if properly conferred.

T.G.E. Ventilatori S.r.l. does not respond (nor civilly nor criminally) for any environmental damage caused by a lack of transportation of the above in place provided or inadequate.

9. STARTUP – WORK – STOP – EMERGENCY STOP

9.1. STARTUP

Apart from the conditions of installation and connection referred to in paragraphs 7 and 8, **starting the fan can only take place by means of the electrical board control (EBC) of the machinery.**

WARNING:

For units that are connected to a variable frequency drive (VFD or inverter), before launching the procedure for starting the machinery, always make sure that you have set the parameters for the minimum acceptable speed and that have been excluded resonant frequencies (if necessary consult the use and maintenance manual of the VFD and/or its manufacturer).

Before proceeding with the start-up of the fan make sure that:

- All safety systems are functioning and operational;
- Impeller, transmission, shaft and motor have not impediments to motion;
- No one is doing the inspection and/or maintenance on machinery or on the aeraulic system.

In addition to the foregoing, it should be recalled that **the start-up phase is the most critical moment of the fan driving motor** because, in a short period of time, take place the switching from the rest condition to the condition of motion to the regime. This maneuver subjects the motor to efforts and electrical over-absorption that can bring it very quickly to failure/fault/thermal collapse, even if the motor is oversized to overcome effectively the cue of inertia of all rotating elements connected to it.

WARNING:

*In order to preserve the motor and with it the proper functioning of the machinery, it is always recommended not to exceed the maximum number of starts per hour declared by the manufacturer for the specific motor. No more precise information can be provided on the maximum number of starts per hour because this parameter is strongly influenced by exogenous factors such as: the motor installed power, the RPM of the impeller, the impeller PD2, installation conditions, characteristics of turbulent fluid flow of the gaseous mixture, etc.. **Good practice is, however, repeat NEVER more than 4 starts per hour.***

9.2. WORK

All T.G.E. Ventilatori S.r.l. fans must work with to inlet/outlet or both ducted.

WARNING:

Not ducted mode, as well as dangerous, gives rise to a phenomenon extremely detrimental to the driving motor of the fan. *The absence of resistance both to the inlet and outlet, in fact pushes the impeller to process the maximum volume of fluid as possible in the time unit (desire limited only by the condition of "choking"), which leads the motor to require more and more power to the electric line. If not limited, such a request, quickly leads the drive unit to an electrical overload and then to failure by melting of the stator windings insulation.*

Any adjustments in the flow handled from the fan impeller (to adapt the supply of fluid to the different needs of the system) can be realized using:

- Shutting dampers, Dapò or butterfly damper;
- Bypass circuits;
- Clutch speed variator or gear box;
- Belt transmission;
- Systems for variation of the impeller resistance;
- Inverter or VFD;
- Fluid dynamics joints, scrolling joints, volumetric joints.

9.2.1 NOISINESS

Noise levels (sound pressure) of the machinery produced by T.G.E. Ventilatori S.r.l. are expressed in [dB (A)] ie weighted decibels according to the audio band (scale A). These values were determined in accordance to ISO 3744, are affected by measurement uncertainty of ± 3 [dB (A)] and are based on measurements made:

- In **free field** on a single reflective surface**;**
- At a distance of **1.5 [m] from the enveloping surface of the machinery** (parallelepiped of dimensions).

USEFUL INFORMATION:

The sound pressure level in the environment working of the machinery depends on operational factors (flow, pressure, performance of the machinery, presence or absence of soundproofing systems of machinery ...), which by environmental factors (acoustic characteristics of the installation location then: room size, number of reflective surfaces and their constituent material, the presence of other machinery working or not, presence of windows, doors and/or openings ...) and may differ substantially from noise level of the fan.

In order to ensure, on the site of the operation of machinery, noise levels under predetermined thresholds are required prior studies of environmental noise impact, taking into account all that has been mentioned before. ***IS NOT SUFFICIENT THAT THE MACHINERY HAVE LESS THAN OR EQUAL TO NOISE LEVEL OF THE THRESHOLD.***

The manufacturer shall make available, upon the express request of the customer, without any obligation and/or bond, to provide advice on the activities necessary for the reduction of the noise level emitted by the machinery.

Please note that local legislation defines both the time of exposure of personnel in relation to the characteristics of sound output (intensity - nature - life), and the threshold level that can be produced from a machinery/plant during the working cycle day/night (acoustic zoning). The engineers during the system design stages must take into account what has been said above, and must strictly adhere to what the standardized and/or legislated. **T.G.E. Ventilatori S.r.l. is not liable (civilly and/or criminally), cannot be regarded as such and is not required to have to use to correct situations "outside the law" that are not directly attributable to the machinery itself or resulting from mistakes made in the RFP.**

	***WARNING:*** *In the event that you must work near the machinery while in operation for long periods of time it is recommended always to wear suitable hearing protection devices, undamaged and certificates.*

9.3. STOP

Fan can be stopped only by switching off the machinery from the EBC.

	***USEFUL INFORMATION:*** *Due to the high moment of inertia of the rotating parts the machinery may take few minutes before completely stop.*
	***WARNING:*** *Never try to reduce the stopping time of the impeller through the use improvised braking systems, foreign bodies or limbs, because than unsafe and potentially dangerous to the physical safety, could damage (beyond repair) the blades of the impeller, alter (significantly) its balancing, produce a misalignment of the transmission and compromise the efficiency of operation of the motor.*

9.4. EMERGENCY STOP

All T.G.E. fans **DO NOT** have systems quick stop systems in case of emergency. The installation of such devices on the machinery and/or push buttons (push-stop) is subject to a specific request by the customer/user.

10. ASSEMBLY AND DISASSEMBLY

If possible and/or unless otherwise agreed, T.G.E. deliver fans completely assembled and ready for positioning and fixing foundation or support structure made of metal, the connection to the aeraulic system and start-up. When size does not allow it and/or when otherwise agreed, the machinery comes to delivery in different parts easily reassemble.

The following instructions provide all the information necessary to ensure that the various components of the fan can be mounted and dismounted without errors.

	***WARNING:*** *It is not enough to install without errors all the elements of the machinery to consider it properly assembled.* ***Each element installed*** *in fact requires, in addition to a correct procedure of assembly/installation,* ***a specific procedure for verification of proper assembly/installation (eg alignment)****.* ***IS RECOMENDED NOT TO COMMISSIONING THE FAN UNTIL HAVING DONE ALL CHECKS.*** ***T.G.E. Ventilatori S.r.l. assumes no responsibility for the malfunction of the machinery after assembly performed in a manner NOT correct by the customer/user.***

As described below may therefore also be used for all operations of ordinary maintenance and/or extraordinary that need/require disassembly of parts of the fan as well as for its dismantling and/or demolition at end of life.

	***WARNING*** *All the operations described in this paragraph shall be carried out strictly in machinery stopped and in safe mode.*
	*During the assembly and disassembly operations of the fan is recommended always to wear overalls, safety shoes, safety gloves and protective head helmet.*

10.1. IMPELLER

The assembly/disassembly of the impeller, regardless of the arrangement of the fan, always requires the removal of the inlet cone from the inlet and, exclusively for fans adjustable, also of the fan casing.

To help, both in understanding that carrying out the operations, see Figure 5.

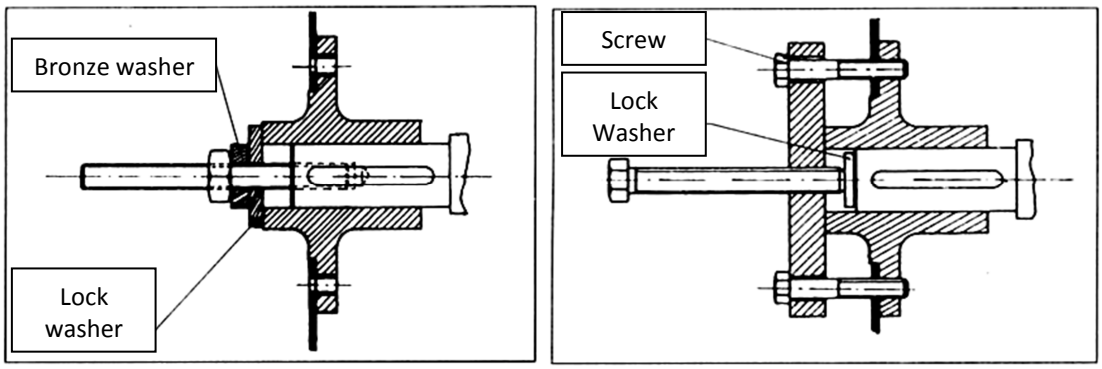


Figure 5 ***(a)*** *Scheme for mounting the impeller of a fan;*
(b) *Scheme for removing the impeller of a fan.*

For the **single inlet fan (SWSI)** assemble/disassemble the impeller as follows:

ASSEMBLY:

- CLEAN AND GREASE BOTH THE DRIVING SHAFT THAT THE FIXING KEY;
- PLACE THE IMPELLER ON THE SHAFT AND PUSH IT HARD;
- FIX THE WASHER HEAD Figure 5a. (IN ALTERNATIVE TIGHTEN THE GRAINS OF THE CONE HUB).

DISASSEMBLY:

- REMOVE THE WASHER HEAD Figure 5a. (IN ALTERNATIVE LOOSEN THE GRAINS OF THE CONE HUB);
- REMOVE THE IMPELLER FROM DRIVE SHAFT ACTING WITH ADEQUATE EXTRACTORS.

USEFUL INFORMATION:

The extraction of the impeller is easier and safer if performed using a hoist.

For the **double inlet fan (DWDI)** in arrangement 6, 17, 18 and 19 assemble/disassemble the impeller as follows:

ASSEMBLY:

Before starting the assembly of the impeller to ensure that the fan casing is free from its removable parts and that the two inlet cones are at hand. Once this is done go on as follows:

- REMOVE THE DRIVING SHAFT FROM THE EASEL;
- LIFT THE IMPELLER AND THE DRIVING SHAFT;
- THREAD THE INLET CONES ON BOTH SIDES OF THE DRIVING SHAFT;
- PLACE THE DRIVING SHAFT ON TWO BEARING SUPPORT;
- COMPLETE THE INSTALLATION OF THE BEARING SUPPORT.

Then proceed with the installation of the fan casing (for the procedure see paragraph 10.2).

DISASSEMBLY:

Before starting the disassembly of the impeller separate the fan casing from its removable parts and release the inlet cones from the fixed part of the fan casing (for the procedure see paragraph 10.2). Once this is done go on as follows:

- REMOVE SUPPORT BEARING;
- LIFT IMPELLER AND DRIVING SHAFT;
- REMOVE THE INLET CONES FROM THE DRIVING SHAFT;
- PLACE THE IMPELLER AND SHAFT ON TWO PARKING EASEL;
- REMOVE THE BEARINGS FROM THE SHAFT.

USEFUL INFORMATION:

The extraction of the impeller is easier and safer if done using a crane or truck-mounted crane.

10.2. FAN CASING AND INLET CONE

When the size of the equipment exceeds the maximum transport dimensions and/or when requested by the customer in the confirmation order, the fan casing can be sectioned into two or more parts. Shape and size of each element depend on the arrangement of the machinery and by its size. It is therefore not possible to define a specific and unique procedure for assembling/disassembling all kind of machinery. By reason of this, therefore, is developed the mode of assembly/disassembly for a specific case (Arr. 8), but at the same time simple enough to be generalized and adapted to more complex situations. To help both in understanding and carrying out the operations see Figure 6.

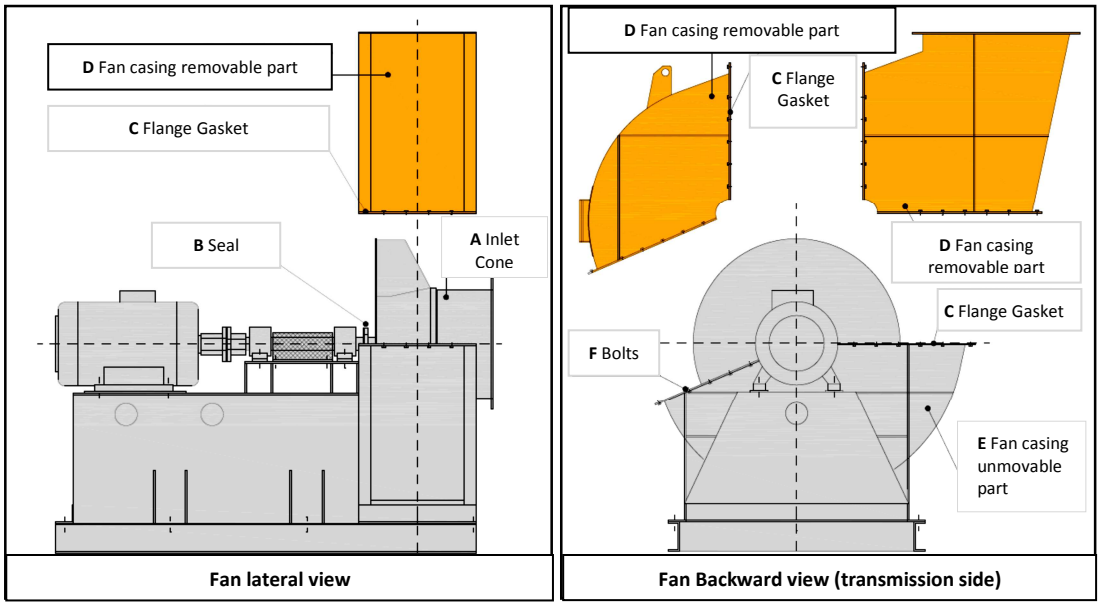


Figure 6 *Scheme for assembling the fan casing.*

Assemble/disassemble the inlet cone and the fan casing as follows.

ASSEMBLY:

- REMOVE THE INLET CONE AND THE SEAL (Details **a/b**) FROM THE FIXED PART OF THE FAN CASING (Detail **e**) REMOVING ALL THE RETAINING BOLTS;
- PLACE THE SEALS ALL ALONG THE CUTTING OF THE FIXED FLANGE OF THE FAN CASING (Detail **e**);
- PLACE THE SEALS (O RING) ALONG A FLANGE CONNECTION BETWEEN THE TWO MOVABLE PARTS OF FAN CASING (Detail **c**);
- PLACE AND SECURE THE FAN CASING DISASSEMBLED PARTS (Detail **d**) ON THE FIXED PART OF IT (Detail **e**);
- INSTALL BOTH THE INLET CONE AND THE SEAL (Details **a/b**) TO THE RECOMPOSED FAN CASING (Detail **d/e**) AND TIGHTEN ALL THE MOUNTING BOLTS.

DISASSEMBLY:

- LOOSEN ALL INLET CONE FIXED BOLTS AND SEAL;
- REMOVE BOTH THE INLET CONE AND THE SEAL (Details **a/b**) FROM FAN CASING;
- LOOSEN ALL MOUNTING BOLTS BETWEEN THE REMOVABLE PARTS OF THE FAN CASING (detail **c**);
- LOOSEN ALL MOUNTING BOLTS BETWEEN THE TWO REMOVABLE PIECES OF THE FAN CASING (Detail **d**) AND FIXED PART OF IT (Detail **e**);
- REMOVE THE TWO REMOVABLE PARTS OF FAN CASING (Detail **d**).

10.3. SAFETY GRIDS

The assembly/disassembly of safety grids from a single inlet fan (SWSI), independent from the arrangement, it is not particularly difficult and is always carried out by loosening the bolts that hold the grids to the inlet/outlet of the machinery.

The double inlet fans (DWDI) in arrangement 6, 17, 18 and 19, from the transmission side are equipped with protection grid cut into two halves which can be assembled/disassembled, like those from the opposite side and on the outlet, loosening the bolts that hold the same fixed at the outlet of machinery.

10.4. BRACKETS AND BEARINGS

All T.G.E. fans adopt type SNL brackets, however, in special cases, particularly heavy and/or by request of the customer, can be adopted other types. In the latter case, for assembly/disassembly, refer to the information contained in the **supplement to the use and maintenance manual for NON CONVENTIONAL BRACKETS.**

USEFUL INFORMATION:

To avoid the onset of vibration and/or noise due to inconsistent alignment of the bearings, place the bearing housing on surfaces perfectly finished and coplanar.

Assemble/disassemble the brackets as follows:

ASSEMBLY:

- CHECK THAT SHAPE, SIZE AND ACCURACY OF THE LOCATION OF THE SHAFT ARE IN ACCORDANCE WITH THE SIZE OF THE SHAFT;
- CHECK THAT THE SURFACE ROUGHNESS OF SUPPORT HAS Ra ≤ 12,5 [µm];
- CHECK THAT THE FLATNESS TOLERANCE IS IT7;
- PLACE THE HOUSING ON LOAD BEARING SURFACE AND INSERT THE MOUNTING BOLTS WITHOUT TIGHTEN, Figure 7;

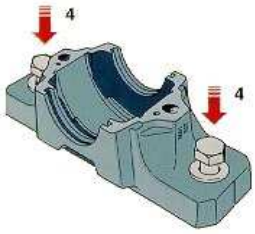


Figure 7 *Mounting bolts*

USEFUL INFORMATION:

If the bearing is mounted clamping bush, determine the position of the housing according to clamping bush on the shaft.
The lubricator must always be placed on the opposite side that of the locking ring nut.
When supports are mounted at the end of the shaft, the grease should be inserted from the side of the lid.
Keep in mind that it is always necessary to consider the full support because base and the cap can be mounted only as they have been provided.

- INSERT HALF SEAL IN EACH OF THE RING GROOVES OF THE BRACKET BASE (IF THE BRACKET MUST BE USED AT THE EXTREMITIES OF THE SHAFT, INSERT A COVER INSTEAD OF THE HALF SEAL).
- FILL THE SPACE BETWEEN THE TWO SEALING LIPS WITH GREASE, FIGURE 8A;
- INSTALL THE BEARING ON THE SHAFT AND COMPLETELY FILL THE BEARING WITH GREASE. (THE REMAINING GREASE MUST BE PUT ON BOTH SIDES OF BRACKET BASE, FIGURE 8B. FOR THE RECOMMENDED QUANTITY SEE ATTACHMENT 2);

(a) (b)

Figure 8 *Greasing.*

- PLACE THE SHAFT WITH THE BEARING IN BRACKET BASE, FIGURE 9.

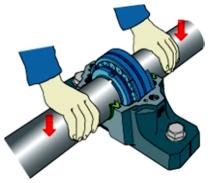


Figure 9 *Shaft, bearing in bracket.*

USEFUL INFORMATION:

For systems of constraint and for systems that use CARB bearings is recommended the insertion of a stop ring on each side of the bearing.

- LINE UP THE HOUSING USING THE ALLIGNMENTENGRAVING AND SLIGHTLY TIGHTEN THE BOLTS, FIGURE 10.

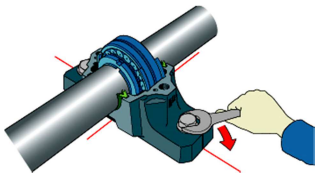


Figure 10 *Line-up*

USEFUL INFORMATION:

For bearings with conical clamping bush, before the final tightening, should be measured the radial clearance between the top ring rolling elements. Rotate bearing a couple of time before measuring (so that the rollers or balls have the opportunity to assume their correct position) measure de clearance with a feeler gauge.

- TIGHTEN LOCKING RING NUT DRIVE WITH THE APPROPRIATE KEY. CHECK MORE THAN ONCE THE REDUCTION OF CLEARANCE BETWEEN THE OUTER RING RACEWAY AND THE ROLLER SURFACE, SEE FIGURE 11.

Figure 11 *Tightening the traction nut*

USEFUL INFORMATION:

Correct assembly is achieved by progressively reducing the clearance till the minimum allowable.

It is not possible to specify the value of the minimum allowable clearance since this varies according to the size and type of the housing, however, this value can easily been found on the catalog of the bearings manufacturer.

- FILL WITH GREASE THE RING GROOVE OF THE HOUSING LID SEAL AND INSERT THE SEAL IN IT, SEE FIGURE 12;

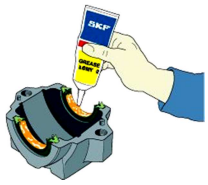


Figure 12 *Tightening the traction ferrule*

- PUT THE HOUSING LID ON THE OTHER CONJUGATE HALF AND TIGHTEN THE BOLTS, FIGURE 13, DETAIL A;

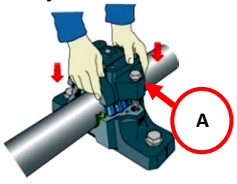


Figure 13 *Bracket closure*

USEFUL INFORMATION:

The top and base of a housing bearing are not interchangeable with those of another, therefore, before tightening the locking bolts, always check that part and counterpart, bear the same identification number.

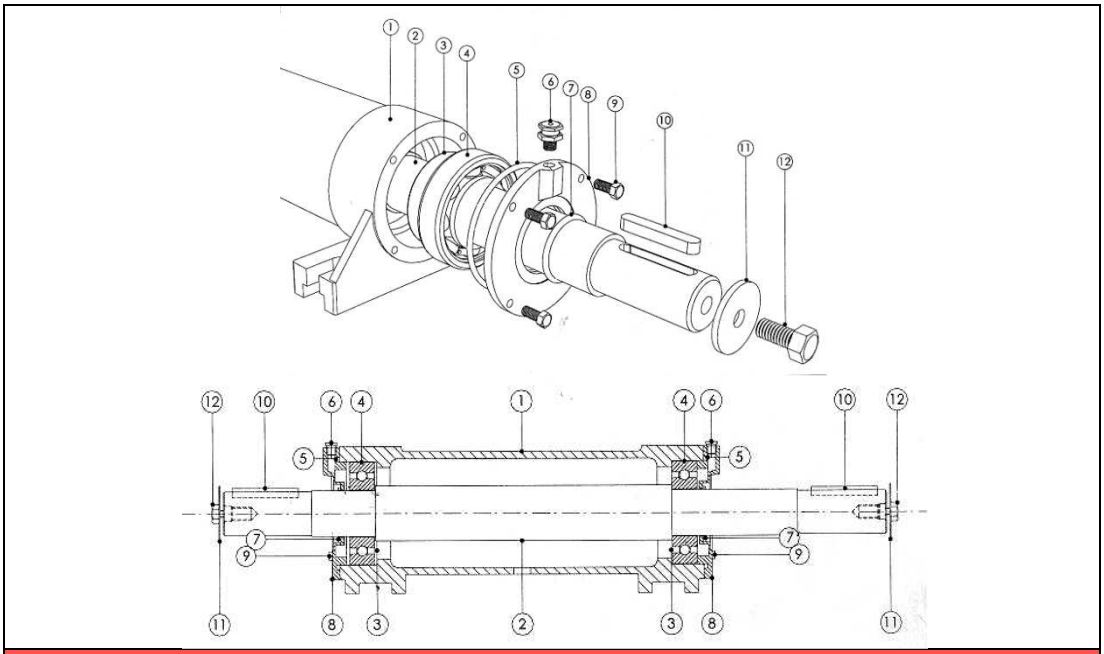
- TIGHTEN THE MOUNTING BOLTS ON THE BASIS ENDURED WHICH IS LOCATED. FOR TORQUE REFER TO ANNEX 3.
-

DISASSEMBLY:

- LOOSEN AND REMOVE THE BOLTS OF THE HOUSING BEARING, FIGURE 13 DETAIL A;
- LOOSEN AND THE REMOVE THE LOCKING RING NUT USING THE APPROPRIATE KEY;
- REMOVE THE SHAFT WITH THE BEARING FROM THE HOUSING;
- LOOSEN AND REMOVE THE MOUNTING BOLTS OF THE HOUSING;
- REMOVE THE SHAFT FROM WHERE HAD BEEN PLACED.

10.5. OMB MONOBLOC

To help both in understanding and carrying out the operations referred to in this paragraph see Figure 14.



KEY

1 – CAST IRON G20 CASING	*7 – V-RING*
2 – STEEL C45 SHAFT	*8 – ALUMINIUM COVER*
3 – GREASE-SHIELD DISC	*9 – COVER SCREW*
4 – SERIES 63 BEARING	*10 – SHAFT KEY*
5 – OR SEAL	*11 – HEAD WASHER*
6 – GREASER	*12 – HEAD SCREW*

Figure 14 *OMB Monobloc diagram*

ASSEMBLY:

- LOOSEN AND REMOVE THE TWO SIDE COVERS PINBOLTS;

	***USEFUL INFORMATION:*** *Marks all removed parts.*

- ELIMINATE ANY TRACE OF PAINT OR FOULING FROM THE ENDS OF THE SHAFT AND FROM THE BEARING HOUSINGS;
- CHECK THAT THE BEARING HOUSINGS BOTH ON THE SHAFT SIDE THAT ON THE FAN CASING SIDE ARE NOT WARPED ;
- INSERT THE SHAFT FROM ONE SIDE OF THE CAST IRON CASING USING A HYDRAULIC JACK OR A ROCKER LEVER;
- GREASE THE BEARING HOUSINGS;
- INSERT THE BEARINGS IN THE HOUSINGS;

	***USEFUL INFORMATION:*** *Check that the bearings are not blocked into their raceway and, with an aligning laser, verify the correct alignment.*

- CHECK THAT THE RUBBER SEALS ARE EFFICIENT (NOT CONTAINING DEFECTS IN PRODUCTION) AND PLACE THEM IN THEIR SITES;
- LIBRICATE THE BEARINGS WITH GREASE APPROPRIATE TO THE TYPE OF BLOCK INSTALLED;
- REPOSITION THE LATERAL COVERS AND SECURE THEM WITH BOLTS.

DISASSEMBLY:

- LOOSEN AND REMOVE THE TWO SIDE COVERS PINBOLTS;

	***USEFUL INFORMATION:*** *Marks all removed parts.*

- REMOVE THE RUBBER SEALS;
- REMOVE THE SHAFT FROM ONE SIDE OF THE CAST IRON CASING USING A HYDRAULIC JACK OR A ROCKER LEVER;

	***USEFUL INFORMATION:*** *To not mark the tree always use soft metal pad.* *Once finished the extraction, the two bearings of the Monobloc will be splined on the shaft and in the casing.*

- REMOVE ALL BEARINGS FROM THEIR RACEWAY;

	***USEFUL INFORMATION:*** *Do not leverage or hammer directly on the cast iron casing because is very fragile.*

- DEGREASE ALL DISASSEMBLED PARTS INCLUDING THE CAST IRON CASING;
- REPOSITION THE LATERAL COVERS IN THEIR ORIGINAL POSITION AND FIX THEM WITH BOLTS.

10.6. MOTOR

The assembly/disassembly of the motor changes with the fan arrangement and with its typology. What follow is referred to the case in which the driving motor is electric and three-phase. The instructions for assembly/disassembly different motor units are contained in the **supplement to the use and maintenance manual for NON CONVENTIONAL DRIVE.**

	***USEFUL INFORMATION:*** *Supporting the motor with a hoist assembly and disassembly it becomes easier and safer.*
	***WARNING:*** *Never dangle the motor on the hoist because there is a high risk of damage to the fan, the transmission joint (if any) and the motor itself. If the hoist is mounted on a pivoting davit manually there is also the specific risk of tipping.*

For executions 9, 10, 11, 12, 13 and 14, for which are provided for mounting sliding guides, proceed as follows:

ASSEMBLY:

	***USEFUL INFORMATION:*** *Before start any operation check that both on the motor than on the driven shaft were mounted the pulleys. Check also that both are stops at 20-25 [mm] from the top of the shaft so that you can later place the protective casing in a simple way...*

- PLACE AND FIX THE SLIDING GUIDES IN THEIR FINAL POSITION ;
- PLACE THE MOTOR ON THE SKIDS AND FIX IT WITH BOLTS WITHOUT TIGHTEN;
- PLACE THE DRIVE BELTS IN TO THE PULLEY GROOVE;
- ACT ON THE ADJUSTING NUTS UNTIL IS REACHED THE CORRECT ARRANGEMENT (TENSION AND ALIGNMENT);
- TIGHTEN THE MOTOR FIXING NUTS.

DISASSEMBLY:

- REMOVE THE TRANSMISSION CARTER;
- LOOSEN, BUT DO NOT REMOVE, ALL FIXING MOTOR NUTS;
- LOOSEN ADJUSTING NUTS OF THE SLIDING GUIDES UNTIL THAT ALL THE TRANSMISSION BELTS WILL BE NOT COMPLETELY LOOSENED;
- REMOVE BELTS;
- REMOVE ALL FIXING MOTOR BOLTS;
- REMOVE THE MOTOR;

For arrangement 4, in which the impeller is overhung on motor shaft there are no bearings on fan and the motor is supported by base proceed as follows:

ASSEMBLY:

- PLACE THE MOTOR ON THE BASE AND FIX IT WITH BOLTS BUT NOT TIGHTEN;
- FIT THE IMPELLER ON THE DRIVING SHAFT MOTOR AND FIX IT (SEE PARAGRAPH 10.1);
- MATCH THE IMPELLER INTO THE CENTER OF THE FAN CASING AND CHECK THAT THE CLEARANCE, BETWEEN THE IMPELLER DISC AND THE BACKWARD SIDE OF THE FAN CASING,IS UNIFORM ;
- TIGHTEN THE RETAINING BOLTS OF THE MOTOR AND CHECK THAT DURING THE OPERATION DO NOT CHANGE, NOR THE CENTERING OF THE IMPELLER NOR THE CLEARANCE BETWEEN THE IMPELLER DISC AND THE BACKWARD SIDE OF THE FAN CASING;
- FIX THE INLET CONE TO THE FAN CASING WITH ITS MOUNTING BOLTS.

DISASSEMBLY:

- REMOVE THE INLET CONE FROM THE FAN CASING LOOSENING THE MOUNTING BOLTS;
- REMOVE THE IMPELLER FROM THE SHAFT OF THE DRIVING MOTOR (see paragraph 10.1);
- REMOVE THE MOTOR FROM THE BASE LOOSENING ALL THE FIXING BOLTS AND SUBSTITUTE IT.

For the arrangement 5 in which the impeller is overhung on the motor shaft, there are no bearings on the fan and the motor is attached to the casing side by its flanged end-shield proceed as follows:

ASSEMBLY:

- PLACE THE MOTOR ON FLANGED END-SHIELD OF THE FAN CASING (BACK SIDE OF THE FAN CASING) AND FIX IT WITH ITS RETAINING BOLTS;
- PLACE THE IMPELLER ON THE MOTOR SHAFT AND FIX IT (see paragraph 10.1) CHECKING THAT THE CLEARANCE, BETWEEN THE IMPELLER DISC AND THE BACKWARD SIDE OF THE FAN CASING, IS UNIFORM;
- FIX THE INLET CONE TO THE FAN CASING WITH ITS MOUNTING BOLTS.

DISASSEMBLY:

- REMOVE THE INLET CONE FROM THE FAN CASING LOOSENING ALL THE MOUNTING BOLTS;
- REMOVE THE IMPELLER FROM THE SHAFT OF THE DRIVING MOTOR (see paragraph 10.1);
- REMOVE THE FAN MOTOR FROM FLANGED END-SHIELD OF THE FAN CASING LOOSENING ALL THE MOUNTING BOLTS

For arrangement 7 and 8, in which the motor is fixed on the load bearing surface of the coupling joint or of the driving shaft, proceed as follows:

ASSEMBLY:

- FIX THE DRIVING SHAFT INTO HALF OF THE COUPLING JOINT;
- TIGHTEN THE FIXING DOWEL;
- FIX THE MOTOR TO THE BASE TIGHTENING FIXING BOLTS;

DISASSEMBLY:

- LOOSEN THE FIXING DOWEL;
- REMOVE THE MOTOR FROM THE BASE LOOSENING ALL THE FIXING BOLTS;
- REMOVE AND REPLACE THE MOTOR.

10.7. TRANSMISSION PROTECTION CARTER

The protective casing of the transmission is attached to the frame by means of screws. For its assembly/disassembly is therefore sufficient to tighten/loosen the mounting screws.

10.8. PULLEYS

Fans in arrangement 9, 10, 11, 12, 13, 14, 18 and 19 (both SWSI that DWDI) use pulleys with conical sleeve to one or more grooves, however, in special cases, particularly heavy and/or on request of the customer can be adopted other types. In the latter case, for assembly/disassembly, refer to the information contained in the supplement to the **use and maintenance manual for NON CONVENTIONAL PULLEYS**.

To help both in understanding that into the carrying out the operations referred to in this section see Figure 15.

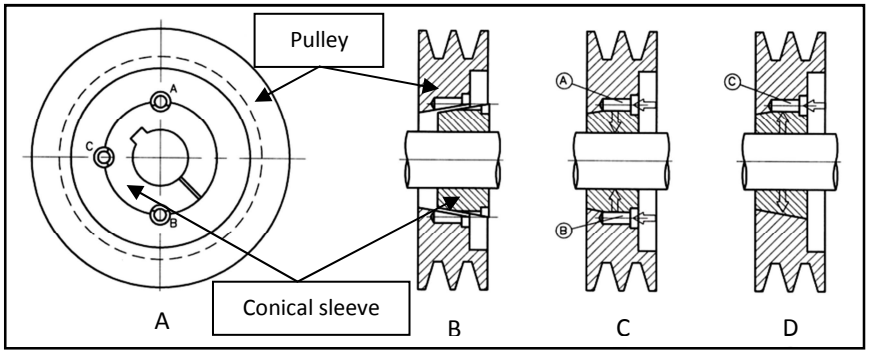


Figure 15 *Scheme for the mounting of a pulley with conical socket.*

ASSEMBLY:

- COMBINE THE PULLEY WITH A CONICAL SLEEVE;
- PLACE THE SCREWS “A” AND “B” WITHOUT TIGHTENING, figure 15, Detail “A”;
- FIT THE PULLEY AND THE CONICAL SLEEVE SET ON THE SHAFT, figure 15, Detail “B”;
- FULLY TIGHTEN THE SCREWS “A” AND “B”, figure 15, Detail “C”;

	***WARNING:*** *After each action that involves the pulleys (which is not the simple cleaning) and before starting up the fan is always necessary to check the correct installation using laser aligners, see Annex 4.*

DISASSEMBLY:

- REMOVE THE SCREWS “A” AND “B” FROM THEIR SITE, Figure 15, Detail “A”;
- REMOVE THE SCREWS IN C, Figure 15, Detail “A”, TILL WHEN THE HUB IS LOOSENED;;
- REMOVE THE PULLEY AND THE CONICAL SLEEVE, Figure 15, Detail “D”, TAKING CARE TO NOT LET FALL THE CONICAL SLEEVE;

10.9. COUPLINGS

The coupling joints, installed exclusively on fans in arrangement 7, 8 and 17, are used as systems for the transmission of motion between the electric motor and the impeller. T.G.E. Ventilatori S.r.l. adopts couplings joint type EXXXP, figure 16, however, in special cases, particularly heavy and/or at the request of the customer, can be adopted other types. In the latter case, for assembly/disassembly, refer to the information contained in the supplement to the use and **maintenance for NON CONVENTIONAL COUPLINGS.**

(a) *(b)*

Figure 16 *Ladder type couplings E200P, (a) disassembled, (b) assembled.*

ASSEMBLY:

- FIT ONE OF THE HALF OF THE COUPLING JOINT ON THE TRANSMISSION SHAFT;
- PUSH HARD HALF OF THE COUPLING JOINT AND IF NEEDED USE SPACERS;
- TIGHTEN THE GRAIN;
- FIT THE OTHER HALF OF THE COUPLING JOINT ON THE DIRVING MOTOR SHAFT;
- PUSH HARD HALF OF THE COUPLING JOINT AND IF NEEDED USE SPACERS;
- TIGHTEN THE GRAIN;
- MATCH THE MOTOR TO THE TRANSMISSION SHAFT AND FIX THE HALF COUPLING JOINTS;
- TIGHTEN THE FIXING BOLTS OF THE COUPLING JOINTS.

	***USEFUL INFORMATION:*** *Always perform the alignment of the coupling joint.*

- FIX THE MOTOR TO THE MOTOR SEAT.

DISASSEMBLY:

- LOOSEN THE GRAIN OF THE MOTOR SIDE HALF COUPLING JOINT;
- REMOVE THE MOTOR FROM THE MOTOR SEAT, LOOSENING ALL THE FIXING BOLTS;
- EXTRACT THE MOTOR;
- UNBLOCK THE MOTOR SIDE HALF COUPLING JOINT FROM THE TRANSMISSION SIDE HALF COUPLING JOINT;
- LOOSEN THE GRAIN ON THE TRANSMISSION SIDE HALF COUPLING JOINT;
- REMOVE THE TRANSMISSION SIDE HALF COUPLING JOINT;

10.10. TRANSMISSION BELT

Fans in arrangement 9, 10, 11, 12, 13, 14, 18 and 19 (both SWSI that DWDI) use trapezoidal transmission belts, in special cases, particularly heavy and/or on request of the customer can be adopted other types. In the latter case, for assembly/disassembly, refer to the information contained in the supplement to the **use and maintenance manual for NON CONVENTIONAL TRANSMISSION BELTS.**

ASSEMBLY:

USEFUL INFORMATION:

Reduce the distance present between the pulleys by unscrewing the bolts holding the motor to the skids and if possible loosening the screws tensioner.

Never force the placement of the straps because this can tear the fibers and modify the alignment of the pulleys.

- PLACE THE BELTS IN TO THE GROOVE OF THE PULLEYS;
- MOVE THE MOTOR ON THE SKIDS TILL REACHING THE CORRECT SPAN BETWEEN THE PULLEYS AND TIGHTEN THE FIXING BOLTS;
- TENSION THE BELTS ACTING ON THE SCREWS TENSIONER;
- FIX THE TRANSMISSION CARTER.

WARNING:

Before start-up the fan verify the correct alignment of the pulleys using laser aligners. To correct misalignment push deeper or slightly pull out the pulley from the hub, to correct the angular misalignment act on the pins of adjustment of the motor and/or transmission.

DISASSEMBLY:

- LOOSEN THE BELTS ACTING ON THE SCREWS TENSIONER;
- LOOSEN THE BOLTS ON THE MOTOR SKIDS;
- REMOVE THE BELTS FROM THE GROOVE OF THE PULLEYS.

USEFUL INFORMATION:

The ideal belt tension is the lowest tension at which the belts do not slip under maximum load conditions. Overtension drive belts reduces the operating life and affect the correct operation of the bearings.

For the correct tension of the drive belts refer to what is reported in Annex 6.

11. CLEANING

C Carefully and regularly clean the fan allows the machinery work better and longer.

	***WARNING:*** *Before you begin any cleaning operation **always stop the machinery and put it absolutely in safe mode.***

In order to prevent unauthorized personnel from enter the working area, thus creating potentially dangerous situations for themselves, for or operators at work and for the machinery, it is recommended to define the work area with stakes signs fitted with interdiction chain and appropriate warning signs.

	***USEFUL INFORMATION:*** *Choose with care all the cleaning products (both general that particular) paying attention that the chosen products do not contain solvents and/or are not chemically aggressive for the item to be cleaned because it could generate imbalances and/or alterations that could affect the characteristics of mechanical resistance of the element itself.*
	***WARNING:*** *For all cleaning operations (both general and particular) is **absolutely forbidden** to use with pressure washer, water jets or abrasives.*
	*During all cleaning operation always wear overalls, safety gloves, safety shoes, goggles and mask to protect the respiratory (risk of suffocation).*

The cleaning intervals vary, according to the concentration of the particles/filaments/adhesives/resins airborne, both in the handled fluid that in the environment of operation of the machinery. General rule wants the cleaning operations are carried out every:

- **2400** hours of operation in the case of **processed fluid and/or clean environment;**
- **1200** hours of operation in the case of **processed fluid and/or weakly dusty environment;**
- **600** hours of operation in the case of **processed fluid and/or moderately dusty environment;**
- **300** hours of operation in the case of **processed fluid and/or dusty environment;**
- **150** hours of operation in the case of **processed fluid and/or extremely dusty environment**;

It is not disputed that in particularly severe working condition the cleaning intervals decrease.

	***RICYCLING:*** *In case that cleaning products used, the dirt and/or the deposits give rise to harmful waste, toxic and/or dangerous both for man that for the environment, is mandatorily required the conveyance of all the above towards tub suitable and sealed for disposal and the safely recycling (as indicated by the MSDS of the product).*

After cleaning and always before the restart of the fan, please check all used tools and, in case that parts of the machinery have been disassembled, do not remain pieces or parts disassembled. Otherwise, do not restart the fan, but categorically proceed to the search of out missing tools and/or to the restoration of the pieces or parts remained disassembled.

11.1. IMPELLER

Dirt and deposits accumulated on the impeller are the main cause of vibrations of the machinery and are a prerequisite both for the performance decrease that for breaking due to fatigue.

The impeller should therefore be cleaned both internally and externally paying attention that all dirt and deposits are completely eliminated. Particular attention should be paid to the leading edge and the trailing edge of the blades, the fittings of these with the disc and the counter disc and the continuity band between the inlet cone and the counter disc.

If the cleaning operation requires the removal of the impeller from the machinery follow the instructions in section 10.1 of this manual.

	***USEFUL INFORMATION:*** *Remove dust deposits and/or filamentary resorting exclusively to vacuum cleaner and/or air blowers. If necessary, use a soft cloth dampened with distilled water or products that are compatible with the surface to be cleaned.*
	***WARNING:*** ***Whenever the impeller is been clean it should always be balanced again.*** *T.G.E. Ventilatori S.r.l. does not respond (nor civilly nor criminally) for damages to persons or let alone be liable for economic damages resulting from downtime associated with failures resulting from non-dynamic re-balancing of the impeller after cleaning.*
	***WARNING:*** *Check that the elements of the impeller are not damaged by wear and/or cracks. Otherwise, stop cleaning, contact T.G.E. Ventilatori S.r.l. after sale service and do not restart for any reason the machinery.*

11.2. INLET AND "CUT OFF"

Dirt and deposits accumulated both on the inlet cone that the "cut-off" of the fan are the main cause of the decrease in aerodynamic performance and are a contributory cause of the change of working point of the machinery.

Both must therefore be cleaned paying attention that all the dirt and deposits are completely eliminated. Particular attention should be paid to the continuity band between the inlet cone and the counter disc, even more the leading edge of the "cut off".

If the operation requires the removal of the inlet cone and impeller from the machinery follow the instructions in section 10.1 and 10.2 of this manual.

	***USEFUL INFORMATION:*** *Remove dust deposits and/or filamentary resorting exclusively to vacuum cleaner and/or air blowers. If necessary, use a soft cloth dampened with distilled water or products that are compatible with the surface to be cleaned.*
	***WARNING:*** *Check that the elements of the impeller are not damaged by wear and/or cracks. Otherwise, stop cleaning, contact T.G.E. Ventilatori S.r.l. after sale service and do not restart for any reason the machinery.*

11.3. FAN CASING

Dirt and deposits are the main cause of the accumulation of heat from the fan casing, as well as potential sources of fire and/or potential trigger points for potentially explosive atmospheres. The fan casing should then be cleaned both internally that externally paying attention that dirt and deposits are completely eliminated. Particular attention should be paid to the internal side of the fan casing behind the disc of the impeller. If the operation requires the removal of the inlet cone and of the impeller from the machinery see section 10.1 and 10.2 of this manual.

	***USEFUL INFORMATION:*** *Remove dust deposits and/or filamentary resorting exclusively to vacuum cleaner and/or air blowers. If necessary, use a soft cloth dampened with distilled water or products that are compatible with the surface to be cleaned.*
	***WARNING:*** *Check that the elements of the impeller are not damaged by wear and/or cracks. Otherwise, stop cleaning, contact T.G.E. Ventilatori S.r.l. after sale service and do not restart for any reason the machinery.*

11.4. MOTOR SEAT

Dirt and deposits may conceal structural fatigue damage (cracks) and/or abnormal formations of rust, both potential causes of failure of machinery with catastrophic consequences. The motor seat should be cleaned externally and, if is possible internally paying attention that all dirt and deposits are completely eliminated. Particular attention should be paid to the load bearing surface of the driving shaft (if any), the motor load bearing surface (pin) and the fixing points of the fan on the concrete/metal base.

	***USEFUL INFORMATION:*** *Remove dust deposits and/or filamentary resorting exclusively to vacuum cleaner and/or air blowers. If necessary, use a soft cloth dampened with distilled water or products that are compatible with the surface to be cleaned.*
	***WARNING:*** *Check that the elements of the impeller are not damaged by wear and/or cracks. Otherwise, stop cleaning, contact T.G.E. Ventilatori S.r.l. after sale service and do not restart for any reason the machinery.*

11.5. SAFETY GRIDS

Dirt and deposits on the safety grids are the main cause of the performance decrease of the fan and fundamental prerequisite for entry into the pumping. All the safety grids should be cleaned paying close attention that all dirt and deposits are completely eliminated. If the operation requires the removal of the safety grid see section 10.3 of this manual.

	***USEFUL INFORMATION:*** *Remove dust deposits and/or filamentary resorting exclusively to vacuum cleaner and/or air blowers.*
	***WARNING:*** *Always verify that the grid texture is welded and that there are no impacts or wear holes. Otherwise, stop cleaning, contact T.G.E. Ventilatori S.r.l. after sale service and do not restart for any reason the machinery.*

11.6. BEARINGS

Dirt, deposits and grease are the main cause of accumulation of heat by bearings and housings, as well as a fundamental prerequisite for the degradation of the lubricant therein contained and consequent wear failure. The housings and bearings should be cleaned paying that attention all the dirt and deposits are completely eliminated. **Never remove housing bearings from their site and do not open them unless absolutely necessary.**

	***USEFUL INFORMATION:*** *Remove dust deposits and/or filamentary resorting exclusively to vacuum cleaner and/or air blowers. If necessary, use a soft cloth dampened with distilled water or products that are compatible with the surface to be cleaned. In case of grease spillages use soft damped clothes with industrial degreasers solvents, gasoline and/or sulfur free.*
	***WARNING:*** *Check that the housing/bearing near the point of connection of this with the load bearing surface, there are no cracks and/or rusty accretions. Otherwise, stop cleaning, contact T.G.E. Ventilatori S.r.l. after sale service and do not restart for any reason the machinery.*

11.7. OMB MONOBLOCK

Dirt, deposits and grease are the main cause of the accumulation of heat from the Monobloc OMB, as well as a fundamental prerequisite for the degradation of the lubricant therein contained and consequent wear failure. The Monobloc OMB should therefore be cleaned externally paying attention that all the dirt and deposits are completely eliminated. Special care must be given to the cast iron case, the driving shaft extremities and the load bearing surface. **Never remove the OMB Monobloc from their home and do not open them unless absolutely necessary.**

	***USEFUL INFORMATION:*** *Remove dust deposits and/or filamentary resorting exclusively to vacuum cleaner and/or air blowers. If necessary, use a soft cloth dampened with distilled water or products that are compatible with the surface to be cleaned. In case of grease spillages use soft damped clothes with industrial degreasers solvents, gasoline and/or sulfur free.*
	***WARNING:*** *Check that the Monobloc OMB near the point of connection of this with the load bearing surface, there are no cracks and/or rusty accretions. Otherwise, stop cleaning, contact T.G.E. Ventilatori S.r.l. after sale service and do not restart for any reason the machinery.*

11.8. MOTOR

Dirt and deposits are the main cause of the accumulation of heat from the motor as well as a fundamental prerequisite for the decrease of its performance, potential sources of fire and/or potential trigger points for potentially explosive atmospheres. The motor should be cleaned externally paying attention that all dirt and deposits are completely eliminated. Particular attention should be paid cast iron cooling fins, the cooling fan and the motor terminal box. **Never remove the motor from its housing unless absolutely necessary.**

	***USEFUL INFORMATION:*** *Remove dust deposits and/or filamentary resorting exclusively to vacuum cleaner and/or air blowers.*
	***WARNING:*** *Check that the motor near the point of connection of this with the load bearing surface, there are no cracks and/or rusty accretions. Otherwise, stop cleaning, contact T.G.E. Ventilatori S.r.l. after sale service and do not restart for any reason the machinery.*

11.9. TRANSMISSION CARTER

Dirt, deposits and grease do not cause particular problems for the transmission carter, but they are unsightly and contribute to the negative judgment on the state of general maintenance of the machinery. It is therefore recommended to clean this element with the same attention and care given to other elements of the fan.

	***USEFUL INFORMATION:*** *Remove dust deposits and/or filamentary resorting exclusively to vacuum cleaner and/or air blowers. If necessary, use a soft cloth dampened with distilled water or products that are compatible with the surface to be cleaned. In case of grease spillages use soft damped clothes with industrial degreasers solvents, gasoline and/or sulfur free.*
	***WARNING:*** *Check the mounting hardware of the transmission carter in order and that the connection of this to the frame of the machinery is secure. Otherwise provide the restoration of the safety condition. If the transmission carter shows impact damages, worn parts and/or scoured, connecting eyelets damaged and/or broken, please contact T.G.E. Ventilatori S.r.l. after sale service to send off a new transmission carter.*

11.10. PULLEYS

Dirt and deposits are the main cause of the imbalances of the pulleys; traces of oil and/or grease, however, contribute to the increase of belts slips. Dirt and deposits are therefore the main cause of the transmission of vibrations from the motor side and the basic prerequisite for both of the declining efficiency that for fatigue breakage of the transmission; traces of lubricant and/or grease, however, besides contribute in reducing the efficiency, decreasing the average life of the transmission belts. Pulleys should then be clean both outside that into the groove, paying attention to the dirt, deposits and traces of oil and/or grease are completely eliminated. **Never remove the pulleys from their site unless absolutely necessary.**

	***USEFUL INFORMATION:*** *Remove dust deposits and/or filamentary resorting exclusively to vacuum cleaner and/or air blowers. If necessary, use a soft cloth dampened with distilled water or products that are compatible with the surface to be cleaned. In case of grease spillages use soft damped clothes with industrial degreasers solvents, gasoline and/or sulfur free.*
	***WARNING:*** *Check that the mounting hardware of the pulley to the drive shaft and the motor shaft are all present and properly tightened. Otherwise providing for the restoration of this condition and check the proper alignment. In case of cracks and/or wear damages and/or impact, stop cleaning, contact T.G.E. Ventilatori S.r.l. after sale service and do not restart for any reason the machinery.*

11.11. TRANSMISSION BELTS

Traces of oil and/or grease contribute to the increase in slip the belts slips and are the basic prerequisite both for the declining of the efficiency than the contraction of the average working life of the belts.

Belts should be cleaned paying attention that traces of oil and/or grease are completely eliminated. **Never remove the straps from their site unless absolutely necessary.**

	***USEFUL INFORMATION:*** *Remove traces of oil and/or grease using a soft dampened cloth with alcohol or detergents (sulfur-free).*
	***WARNING:*** *Check that the belts have not cracks or fraying. Otherwise, replace belt or, if the transmission involves the use of multiple belts, replace the entire set.*

12. INSPECTION – ROUTINE MAINTENANCE – EXTRAORDINARY MAINTENANCE

This section of the manual and describes the procedures for conducting inspection – routine maintenance – extraordinary maintenance

12.1. DEFINITION OF TIMES FOR ACTION

PHASE	PERIODICITY[2]	SKILLS
Surveillance/ Simple Inspection	Quarterly	User + Qualified Technician
Surveillance /Deep Inspection	Six-monthly	Qualified Technician
Routine Maintenance	Occasional	Qualified Technician
Extraordinary Maintenance	Occasional/Rare	Specialized Company

12.2. BEHAVIOUR DURING INSPECTION AND MAINTENANCE

The operations of inspection and maintenance may involve:

- The removal of protections available to safeguard for the safety of personnel;
- The removal of protections available to safeguard the integrity of the machinery;
- The partial disassembly of the components of the fan;
- The partial disassembly of the interlocked component of the fan.

At the end of each inspection and/or maintenance which resulted in any of the above actions, restore the pre-existing state of security and structure of machinery/equipment.

	***WARNING:*** *Before inspecting and/or maintaining the machinery stop and secure it.*
	***WARNING:*** *In case of deformations, cracks, irregularities of operation, and/or abnormal in the general condition of machinery, stop any operation in progress, contact T.G.E. Ventilatori S.r.l. after sale service and do not restart for any reason the machinery.*
	*During all cleaning always wear overalls, safety gloves, safety shoes, goggles and mask protecting the respiratory (**risk of suffocation**).*

It is also recommended:

- Do not use controls, hoses or lines of electric connection as handholds;
- Notify to director the presence of tampering and/or any changes to the machinery compared to the previous control.

12.3. SIMPLE INSPECTION

The inspections, configured as simple periodic surveillance activities on the machinery, should be repeated quarterly.

The commitments related to this activity can be carried out independently by the user since it does not require specific knowledge and/or skill, but only the knowledge of general safety rules in force on the working site of the machinery...

CHECK UP – SIMPLE INSPECTION:

- Check the general condition of the concrete/metal structure upon which the machinery is fixed;
- Check the status of the painted parts of the fan;
- Check the absence of generalized and localized corrosion phenomena on the machinery;
- Check of the dust layer and/or deposit present on the fan;
- Check of the absence of hardware and/or missing loose;
- Check the absence of abnormal noises or not due to the normal operation of the machinery;

[2] *For a work cycle of the work of the fan 24 h/day;*

- Check the absence of high magnitude vibration;
- Check the temperature of the fan casing, bearing and motor.

12.4. DEEP INSPECTION

The thorough inspections, configured as periodic surveillance activities on the machinery, should be repeated every six months.

The commitments related to this activity must be carried out only by qualified technicians because they require specific knowledge and/or skills in both technical and accident prevention.

CHECK UP – DEEP INSPECTION:

- Checking the status of the tightness of all bolts and sealing connection using a torque wrench (for tightening torques see section 7.2.1);
- Check the condition and tension of drive belts (if any);
- Check the temperature of the motor, bearings and fan casing;
- Check the condition of the bearings;
- Check the vibrations;
- Check of the absence of cracks and/or impact damages on the impeller;
- Check of the absence of excessive accumulations of dust on the blades of the impeller;
- Check of the absence of excessive accumulations of dust on the inlet cone and/or on the "cut off";
- Check the head screw securing of the impeller;
- Check the seals condition;
- Check of the absence of leakages;
- Check of minimum clearance.

	***WARNING:*** *In cause of the reduction of the minimum clearance is due to a loosening of the hardware immediately re-tighten bolts and screw (for torques see section 7.2.1).*
	***WARNING:*** *In case of the reduction of the minimum clearance is due to a deformation of the fan casing or of the impeller do NOT START ANY MAINTENANCE ACTION, but immediately contact T.G.E. Ventilatori S.r.l. after sale service and do not restart for any reason the machinery..*

12.5. ROUTINE MAINTENANCE

Routine maintenance consists in cleaning the machinery without removing parts it, in the lubrication of the parts, realignment and tightening/replacement of all hardware that, from simple or detailed inspection, proves loose or compromised (for tightening torques see section 7.2.1).

12.6. EXTRAORDINARY MAINTENANCE

Extraordinary maintenance consists in cleaning of the machinery, dismantling of parts of it and in the substitution of compromised elements of the fan (eg. impeller, inlet cone, bearings, and transmission shaft, pulleys, belts, motor and anti-vibration joints).

	***WARNING:*** *Not repair parts of the fan in case of: impact damage, dust abrasion damage, wear from rubbing, fracture into the welding continuity, fatigue cracking, rusting localized or generalized, overheating and/or combustion.* ***In all these cases it is necessary to replace the element.***

12.6.1 IMPELLER

The only extraordinary maintenance activities permitted on the impeller are:

- Disassembly for cleaning in case of dusty fluids, filamentous or dispersions of resins/adhesives (see paragraph 10);
- Replacement.

12.6.2 FAN CASING AND INLET CONE

The only extraordinary maintenance activities permitted on the fan casing and on the inlet cone are:

- Disassembly for cleaning in case of dusty fluids, filamentous or dispersions of resins/adhesives (see paragraph 10);
- Replacement.

12.6.3 MOTOR SEAT

The only extraordinary maintenance activities allowed on the motor seat is the paint "touch-up" in the event of not rusting. When the motor seat is removable the only extraordinary maintenance activity permitted is the replacement.

12.6.4 SAFETY GRIDS

The only extraordinary maintenance activities permitted on the safety grids are:

- Disassembly for cleaning in case of dusty fluids, filamentous or dispersions of resins/adhesives (see paragraph 10);
- Replacement.

12.6.5 BEARINGS

The only extraordinary maintenance activities permitted on supports and bearings is the replacement.

12.6.6 OMB MONOBLOCK

The only extraordinary maintenance activities permitted on the Monobloc OMB is the replacement.

12.6.7 MOTOR

The only extraordinary maintenance activities permitted on the motor is the replacement.

12.6.8 PROTECTION CARTER

The only extraordinary maintenance activities permitted on the protection carter are:

- Disassembly for cleaning when operating in environments with dust and/or airborne filaments, as well as in the case of obvious traces of grease and/or oil on the surface (see paragraph 10);
- Replacement.

12.6.9 PULLEYS

The only extraordinary maintenance activities permitted on the pulleys is the replacement.

12.6.10 TRANSMISSION BELTS

The only extraordinary maintenance activities permitted on the drive belts is the replacement.

13. REGISTER OF MAINTENANCE

The register of maintenance collects all records relating to the operations of ordinary and extraordinary maintenance carried out on during the working life of the fan. It is a detailed report about who did what and when, accompanied by the results of the inspections and any notes of interest.

Drafting and safekeeping of the register of maintenance is unique competence of the customer/user and in absence of it, warranty support or requests for after sales assistance are much more onerous.

13.1. REGISTER STRUCTURE

MAINTENANCE REGISTER

DATE	CHECK OR TEST	SERVICE HOURS	TYPE OF INTERVENTION	OBSERVATION	SIGNATURE
	Accumulation of dust on the fan (Motor seat - Fan casing)				
	Accumulation of dust on the bearing or Monobloc				
	Accumulation of dust on the motor				
	Accumulation of dust and/or lubricant On the drive belts				
	Condition of the transmission belts				
	Drive belts tension				
	Accumulation of dust and/or lubricant on pulleys				
	Condition of the pulleys				
	Accumulation of dust on the fan				
	Fixing grounding bolts				
	Damping joints thickness (Ground damper)				
	Joint bolts (Inlet cone - Damping Joint. - Silencer)				
	Condition of the anti-vibration joint				
	Ground wiring (between the motor and fan)				
	Ground wiring (Between the fan and the ground)				
	Ground wiring (Between fan casing and inspection door)				
	Ground wiring (Between carter, belt and motor seat)				

MAINTENANCE REGISTER

DATE	CHECK OR TEST	SERVICE HOURS	TYPE OF INTERVENTION	OBSERVATION	SIGNATURE
	Ground wiring (Between the Monobloc and load bearing)				
	Wear of the bearings				
	Condition of the shielding				
	Bearings lubrication				
	Closing/sealing of the impeller inspection door				
	Control of minimum impeller clearance				
	Accumulation of dust on the impeller				
	Condition of the painting of the impeller				
	Condition of the wear of the impeller				
	Condition of the welds of the impeller				
	Condition of the fan welds				
	Condition of the painting of the seat				
	Condition of the painting of the fan casing				
	Condition of the painting of the carter				
	Localized rust				
	Environmental temperature (With fan on work)				
	Temperature of the bearings (With fan on work)				
	Motor temperature (With fan on work)				
	RMS on the motor side bearings				
	RMS on the Impeller side bearings				

14. LUBRICATION

The careful management of the interventions of lubrication on the machinery and on the mechanisms is a necessary condition to guarantee both the efficiency of the machinery that its effective compliance with the service. Lubricate the parts in relative motion between them in fact reduces the friction and wear, removes some of the heat that is generated during operation and protects the surfaces.

14.1. BEARINGS FOR SEPARATE BEARINGS

The fluid that separates the coupled parts of the bearings is generally mineral oil, both if the lubrication is oil that if the lubrication is grease. The choose of the lubricant is in base on the kinematic viscosity of the mineral oil. **T.G.E. Ventilatori S.r.l., except when the working conditions are particularly severe and/or unless otherwise agreed with the customer, adopts grease lubrication.**

Depending on the degree of separation Λ[3] between the rolling elements and raceways there are three types of lubrication:

- $\Lambda \geq 4$: the surfaces are completely separate and the lubrication condition is complete elastodynamics;
- $1 < \Lambda < 4$: the surfaces are partially separated and the lubrication condition partially elastodynamics;
- $\Lambda \leq 1$: the surfaces are in metallic contact and the lubrication is at its limit condition.

The lubrication can be considered satisfactory when $\Lambda = 1$.

Lubricating greases adopted by T.G.E. Ventilatori S.r.l are chosen according to:

- Consistency: in most cases using grease with a grade of consistency 2 [4];
- *Temperature range: in most cases are used grease with organic soap whose operative range is from -55 [° C] to +150 [° C]*;
- Antirust characteristics: if required it are added to the grease antirust additives such as sodium nitrite[5];
- *Mechanical stability*;
- *Miscibility*;
- *Base oil viscosity*.

WARNING:

Recommended grease: ARCANOL L71V FAG.

Never mix grease that do not have the same mineral oil base, do not have the same base oil viscosity, do not have the same type of thickener and not have the same consistency (NLGI).

Nor deficit and nor exceed with lubricant to avoid the overheating of the parts and the consequent failures. ***At the end of the lubrication always check the functionality of the sealing.***

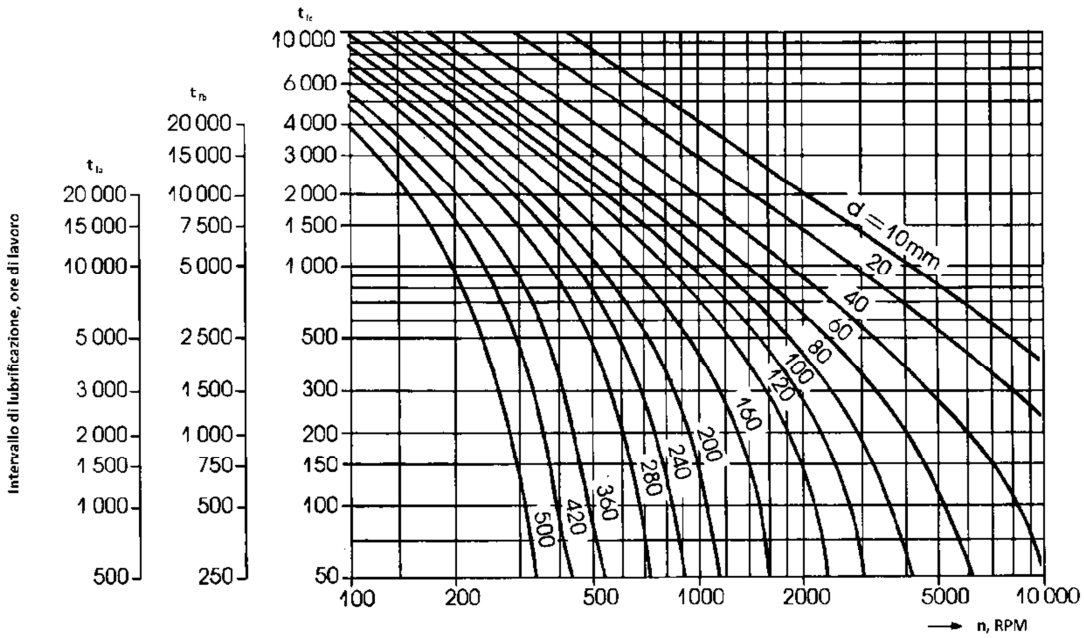
All lubricants degrade in time and the rapidity of degradation depends on:

- Type and dimension of the bearing;
- Rotational Speed;
- Operating Temperature;
- Effectiveness of the housing sealing;
- Grease Type.

The relubrication intervals in hours for resistant oxidation grease and of medium quality, for bearings subjected to normal loads and at a temperature of +70 [°C] measured on the bearing housing is shown in Figure 17. Over +70 [°C] every increase of 15 [°C] halves the lubrication interval. Under +70 [°C] relubrication intervals can be extended and when the temperature drops below +50 [°C] ranges can be doubled. **Sealed bearings are supplied with a sufficient amount of grease for the entire expected life of the bearing and therefore do not require lubrication.**

[3] *Λ is a function of the relative velocity between the surfaces, the kinematic viscosity of the oil, a small part of the force acting between the surfaces and the standard deviations of surface roughness.*

[4] *In the case where the operating temperatures are very low adopt greases with consistency grade 1, while in case of vibration, or high temperatures adopt greases with consistency grade 3.*



t_{fa} = Radial ball bearings;

t_{fb} = Straight roller bearings and needle roller bearings;

t_{fc} = Spherical bearings, tapered roller bearings, thrust ball bearings, full complement cylindrical roller bearings (0.2 t_{fc}), thrust cylindrical roller (0,5 t_{fc});

d = Bore diameter of the bearing

Figure 17 *Chart for calculating the bearings lubrication range.*

T.G.E. fans are sized to ensure a lifetime of 35,000 hours in the conditions of correct lubrication.

WARNING:

This warranty is valid if the transmission or elastic coupling were calculated and assembled at T.G.E.

The amount of grease to be used for the lubrication can be easily obtained using the table 3.

Corpo	Quantità di grasso Primo riempimento[1]	Rilubrificazione
-	g	
SNL 205	25	5
SNL 206-305	40	5
SNL 207	50	10
SNL 208-307	60	10
SNL 209	65	10
SNL 210	75	10
SNL 211	100	15
SNL 212	150	15
SNL 213	180	20
SNL 215	230	20
SNL 216	280	25
SNL 217	330	25
SNL 218	430	40
SNL 505	25	5
SNL 506-605	40	5
SNL 507-606	50	10
SNL 508-607	60	10
SNL 509	65	10
SNL 510-608	75	10
SNL 511-609	100	15
SNL 512-610	150	15
SNL 513-611	180	20
SNL 515-612	230	20
SNL 516-613	280	25
SNL 517	330	25
SNL 518-615	430	40
SNL 519-616	480	50
SNL 520-617	630	55
SNL 522-619	850	70
SNL 524-620	1 000	80
SNL 526	1 100	95
SNL 528	1 400	110
SNL 530	1 700	130
SNL 532	2 000	150

[1] Riempie circa il 40 % dello spazio libero nel sopporto

Table 3 *Quantity of grease for lubrication depending on the type of bearing.*

Alternatively it can be used the method described in Annex 2 of this manual and maintenance.

DO NOT DISPOSE OF WASTE OILS AND GREASE IN THE ENVIRONMENT.

Oils and grease exhausted are products extremely polluting for the environment and for the waters. It is therefore recommended to collect and dispose/transfer them to specific areas. Contact specialized companies in the collection, recycling and/or disposal these products.

14.2. MONOBLOCK BEARINGS

The Monobloc are pre-lubricated with EP2 LITEX (ROL ILO) a lithium grease with EP additive, NLGI 2, ISO VG 150 base oil viscosity, temperature range from -20 [° C] to +120 [° C].

Equivalent greases are:

- AGIP GR/MU EP-2;
- BP Energrease LS-EP-2;
- ESSO BEACON EP-2;
- MOBIL MOBILUX EP-2;
- SHELL ALVANIA EP-2;
- TOTAL MULTIS EP-2;
- INA-FAG Arcanol LOAD 220;
- SKF LG EP2 ;

The presence of the grease in the bearing is ensured on one side by the cap, on the other by the special screen; is still necessary to re-lubricate at regular intervals with the appropriate quantities, see figure 18.

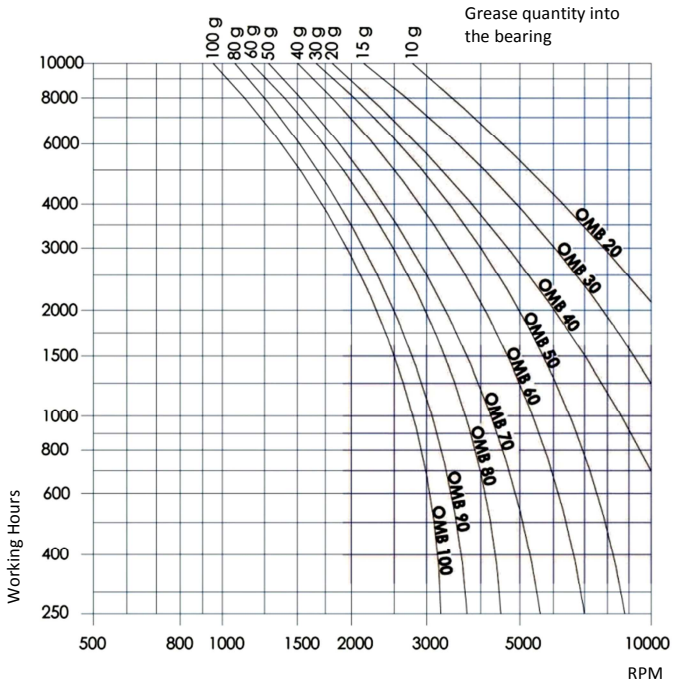


Figure 18 *Amount of grease as a function of hours of operation and the type of bearing.*

There is no danger of over lubrication because the grease in excess is pushed towards the center of the casing where there is a drain hole which serves as a vent condenser. On the use of tubes for lubrication, make sure you are not clogged, but full of grease in good condition.

⚠	***WARNING:*** *The absence or improper lubrication can seriously affect the operation of the Monobloc*

15. SPARE PARTS

WARNING:
On all T.G.E. fans must be mounted exclusively original spare parts.

Replacement parts can be obtained directly at T.G.E. Ventilatori S.r.l. indicating in order:

- Type;
- Job no°;
- Serial number;
- Item;

of the fan for which spare parts are needed.

If present, the components of the transmission groups, such as pulleys, bushings, V-belts and bearings are normally available on the market so the user can order these parts directly from the original manufacturer.

LIST OF AVAILABLE SPARE PARTS

PROGRESSIVE Nr	DESCRIPTION	PROGRESSIVE Nr	DESCRIPTION
1	Inlet grid	15	Silicone seal on the outlet flange
2	Inlet cone	16	Silicone seal on the inspection door
3	Impeller head bolt	17	Inspection door
4	Head washer	18	Fan hardware
5	Impeller	19	Retaining ring
6	Outlet grid	20	Housing ring plate
7	Nameplate	21	Bolts
8	Pulley	22	Monobloc
9	Belts carter	23	Monobloc cover
10	Trapezoidal belts	24	Inlet damping joint
11	Motor	25	Outlet damping joint
12	Driving motor shaft carter	26	Base damping joints
13	Fan casing	27	Fan casing bleed valve
14	Silicone seal on the inlet flange	28	Transmission joint

16. TROUBLESHOOTING

Problem	Cause	Remedy
The machinery does not start	Power supply	Check that the main power switch of EBC of the machinery is in ON position.
	Power supply	Check that the protection fuses are not blown.
	Power supply	Check the correct voltage of the power supply.
	Electrical wiring	Check that wiring in the motor terminal box is correct
	Faulty motor	Replace the motor.
	Mechanics	Check that all drive belts are intact.
		Check the tension of the drive belts.
		Check for tighten pulleys.
	Incorrect sizing of the motor	Replace the motor.
The motor is overheated	Overload	Check that the mechanical parts driven by the motor are not subject to unexpected resistance.
	Incorrect sizing of the motor	Replace the motor.
	Too long starting time	The impeller PD2 has been underestimated, change the motor.
		Correct the start-up mode.
Excessive power consumption	Circuit	Losses were underestimated and the working point is different from the design point.
		Check if the shutter damper, the Dapò, the battery or the bypass correctly works.
		Check the tightness of the inspection door.
		Check the condition of the filters.
	Faulty motor	Replace the motor.
	Incorrect sizing of the motor	Replace the motor.
	Impeller	Check the RPM.
		Check the direction of rotation of the impeller.
Overheated bearings	Lubrication	Check that the grease in the bearings is: not excessive, insufficient or degraded.
	Damage	Replace the bearings.
	Transmission	The tension of the drive belt is excessive.
	Mechanics	The bearings are not properly aligned.
	Mechanics	The drive shaft is not straight.
Degraded transmission belts	Incorrect tensioning	Replace the belt and adjust tension.
	Incorrect mounting	Replace belt and install it correctly.
	Misalignment of the pulleys	Align pulleys and replace belts.
	Worn pulleys	Replace the pulleys + belt and re-tension.
	Strong vibrations	Check the belt tension and replace it.
	Insufficient voltage	Replace the belt and re-tension it.
	Excessive voltage	Replace the belt and re-tension it.
	Excessive scroll	Replace the belt and re-tension it.
	Exceeded life	Replace the belt.
	Dirt/external items	Clean/remove external items and replace belts.
	High temperature (>80 [°C])	Use belt for high temperatures or remove the cause of overheating.
	Losses from the motor, bearings or the Monobloc	Eliminate leaks, clean pulleys, change belts.

Problem	Cause	Remedy
Overturning of driving belt	Misalignment of the pulleys	Align pulleys and replace the belt.
	Worn groove	Replace the pulleys.
	Wrong groove profile	Replace the pulleys.
	Strong vibrations	Check the belt tension.
	Insufficient voltage	Replace the belt and re-tension it.
	Wear of the belt side	Replace the belt.
Breaking of the transmission belt	Undersized transmission	Redesign the transmission.
	Forced assembly	Replace the belts and install them without forcing.
Lubricant leaks	Worn or defective sealing rings	Replace sealing rings.
	Worn of the ring shaft seal	Replace sealing rings or the shaft.
Excessive or abnormal noise	Impeller	Check the minimum clearance.
		Tighten the impeller hub.
		Check the absence of excessive obstructions on the outlet (severe and intermittent noise) or the inlet (continuous and high-pitched noise).
		Clean the dirt that on the blades.
		Rerun the balancing.
	Fan casing	Check the minimum clearance.
	Mechanics	Tighten collars and inlet.
		Tighten the collars of the bearings on the shaft.
		Lubricate the bearings.
		Replace faulty bearings.
		Tighten the pulleys on the motor shaft/impeller.
		Check for proper belt tension.
		Check the correct belt tension.
		Check the alignment of the pulleys.
	Motor	The motor operates with a single phase.
		There is an imbalance in the electric motor.
Excessive or abnormal vibration	Impeller	Check the balancing of the impeller.
	Worn bearings	Replace the bearings.
	Worn anti-vibration joints	Replace the deteriorated anti-vibration joints.
	Transmission joint (Misalignment)	Realign the coupling joints.
	Transmission joint (Loose screws and/or micro frictions under the screw head)	Check coupling parts and replace if damaged, replace the screws and tighten them.
	Transmission joint (Loose docking nut)	Correct alignment of the joint, and if necessary tighten the screw hub.
Breaking of the lamellar pack (Trans. Joint)	Mechanics	Realign the transmission joint.
		Reduce the forces acting on the shaft coupling.
		Check the operating parameters of the drive shaft coupling.
		Unlocking the drive shaft coupling from blocking items.
		Clean the impeller from blocking items.
Breaking of screws (Trans. Joint)	Mechanics	Reduce the vibration of the impeller and/or the motor

Problem	Cause	Remedy
Low flow rate	Circuit	Check for leaks in the aeraulic system.
		Check that the regulating devices are correctly opened.
		The circuit has been inadequately dimensioned.
		Check the absence of leaks from the seals and the sealing elements.
		Check the absence of abnormal or unexpected obstructions in the air flow system.
	Fan	Check the right rotation of the impeller.
		Check the angle of incidence impeller blades.
		Check the RPM of the impeller or increase the RPM of the impeller.
High flow rate	Circuit	Check that the regulating devices are correctly closed.
		The circuit was incorrectly dimensioned.
		Silencers are not installed.
		Filters not installed.
		Safety grids not installed.
	Fan	Excessive speed of the impeller.
		Check the angle of incidence of the blades of the impeller.
Wrong static pressure	Circuit	Recalculate the load losses of the system.
		Clean the safety grids.
		Clean filters and batteries.
		Check for leaks in the aeraulic system.
	Fan	Clean the impeller.
		Clean the impeller casing.
		Clean the inlet and/or the outlet.

17. MACHINERY DOCUMENTS FACSIMILE

17.1. DECLARATION OF CONFORMITY

CTI

Costruttore: Manufacturer: **TGE Ventilatori S.r.l.** Via F. Noé 9/11 20080 Bubbiano (MI) www.tgeventilatori.com
Tel 1: (+39) 02.90.84.89.34 Tel 2: (+39) 02.90.87.08.94 e.mail: Info@tgeventilatori.com pec: tgeventilatori@legalmail.it

DICHIARAZIONE DI CONFORMITÀ AI SENSI DELLA DIRETTIVA MACCHINE 2006/42/CE

DECLARATION OF COMPLIANCE IN CONFORMITY WITH THE MACHINERY DIRECTIVE 2006/42/EC

(allegato II, parte 1, sezione a)

(annex II, part 1, section a)

PER IL VENTILATORE

FOR THE FAN

Denominazione generica: *Generic denomination:*	**VENTILATORE CENTRIFUGO** ***CENTRIFUGAL FAN***
Denominazione commerciale: *Commercial Denomination:*	-
Descrizione: *Description:*	-
Funzione: *Function:*	-
Modello: *Model:*	-
Tipo: *Type:*	-
N° di serie: *Serial No.:*	-
Rif. Cliente: *Customer Ref.:*	-
Marca: *Brand:*	-
Anno di costruzione: *Year of construction:*	-

La società TGE Ventilatori S.r.l., in qualità di produttore, dichiara sotto la propria responsabilità che il ventilatore sopra riportato
The company TGE Ventilatori S.r.l., as manufacturer, hereby declare that the fan above

soddisfa i requisiti essenziali della Direttiva macchine CE 2006/42/CE.
meets the essential requirements of the EC Machinery Directive 2006/42/EC.

soddisfa i requisiti essenziali della Direttiva Compatibilità Elettromagnetica 2006/108/CE
meets the essential requirements of the Electromagnetic Compatibility Directive 2006/108/CE

soddisfa i requisiti essenziali della direttiva Direttiva Bassa Tensione 2006/95/CE:
meets the essential requirements of the Low Voltage Directive 2006/95/CE:

ed inoltre sono state applicate le seguenti norme armonizzate:
and besides that have been applied the following harmonized standards:

ISO 281 ; ISO 1210 ; ISO 1813 ; ISO 1940 ; ISO 3744 ; ISO 5801 ; EN ISO 12100-1 ; EN ISO 12100-2 ; EN ISO 12499 ; EN 13463-5 EN ISO 13857 ; EN 14986 ; ISO 14694 ; ISO 20816 ; EN 50204-1 ; EN 60529 ; EN 61000-3-2 ; EN 61000-6-3 ; EN 61000-6-4

Il modello rappresentativo della famiglia di ventilatori con la denominazione commerciale di cui sopra
The family representative model with the above commercial name

soddisfa i requisiti della Direttiva Macchine CE 2006/42/CE come verificato dall'ente notificato XXXX in data gg/mm/aaaa, atto n° XXXX
meets the requirements of the EC Machinery Directive 2006/42/EC as verified by the notified body XXXX on dd / mm / yyyy, act n ° XXXX

Il sistema qualità è stato controllato e verificato dall'ente notificato XXXXX in data gg/mm/aaaa
The quality system has been prepared and checked by the notified body XXXXX on mm/dd/yyyy

L'ufficio tecnico sito nella sede aziendale è autorizzato alla costituzione e all'archiviazione del fascicolo tecnico.
The corporate technical office is authorized to create and storage the technical dossier

Il fascicolo tecnico n° XXXXX è stato redatto e depositato presso
The technical File No. XXXXX and its annexes have been prepared and filed with
il laboratorio notificato XXX (O.N. n. XXXXX) con ricevuta di deposito n. XXXXX del gg/mm/aaaa
the notified laboratory XXX (ON n. XXXXX) with the deposit slip no. XXXXX on mm/dd/yyyy

Si rammenta che
Notice That

Il Ventilatore sopra indicato, se sprovvisto di griglia di protezione sulla flangia aspirante e premente,
The fan above, if lacking of inlet and outlet protection grid,
non può essere messo in funzione se non canalizzato in aspirazione e in mandata.
can not be started unless if canalized in suction and delivery.

Il venitlatore sopra indicato mantiene la sua conformità solo se installato e manutenuto secondo le istruzioni
The fan above maintains its compliance only if installed and maintained according to
di TGE Ventilatori S.r.l. di messa in servizio, montaggio e manutenzione.
TGE Ventilatori Srl instruction of commissioning, installation and maintenance.

T.G.E. Ventilatori S.r.l. socio unico
Amministratore Torrente Gianluca

Bubbiano, li:

Questa dichiarazione non contiene alcuna garanzia. È necessario osservare le istruzioni relative alla sicurezza fornite
This statement does not contain any guarantees. You must observe the safety instructions that came with
con la documentazione relativa al prodotto. Questa dichiarazione perde di validità in caso di modifica non concordata del macchinario.
your product documentation. This declaration becomes invalid in case of Non-concerted modification of machinery.

17.2. CERTIFICATE OF BALANCING

CTI

T.G.E. VENTILATORI S.R.L.

BALANCING CERTIFICATE

according to UNI N°4218 ISO N°1940

Customer - Customer Ref. -

Serial No° -

Rotating to balance

Type	-	
Weight	-	K
Rotational Speed	-	RPM
Balancer	(CEMB ZE 2/300 G	MB ZB 4 00)

Correction planes	Left	Right
Maximum allowable unbalance in grams	-	-

Residual unbalance

	0,00	0,00
	100°	100°

Balancing grade **2,50**

Note

Bubbiano, - Performer

T.G.E. Ventilatori Srl socio unico Via Francesco Noè 9/11 20080 BUBBIANO (MI) Italy
Tel.(++39) 02 90848934 90848684 90870894 Fax 90848768
P.I. e C.F. 07060390965 info@tgeventilatori.com PEC: tgeventilatori@legalmail.it www.tgeventilatori.com

18. REVISIONS DIARY

REVISION DIARY		
Rev. No.	**Date**	**Changes made/ purpose of review**
00	30/06/2012	First edition
01	31/01/2014	User manual update

19. NOTES

20. ATTACHMENTS

20.1. ATTACHMENT 1 – *WARRANTY REGISTRATION FORM*

Dear Customer, **T.G.E. VENTILATORI S.r.l.** respects and protects your privacy.

Pursuant to art. 13 of (Italian) Legislative Decree No 30 June 2003. 196 - "Code regarding the protection of personal data" - we provide below the information regarding the processing of personal data that you'll want to give in order to receive warranty service provided by **T.G.E. VENTILATORI S.r.l.**

1. **Aims of treatment: provision of the services required**

   Some of your personal data (name, last name, city, email address, et al.) Will be processed by **T.G.E. VENTILATORI S.r.l.** to satisfy your request and give effect to the services offered by the Company. The provision of such personal data is optional, but a refusal will make it impossible to use the warranty service provided by **T.G.E. VENTILATORI S.r.l.**

2. **Additional purposes: marketing, surveys, commercial communications.**

   With your express consent, free and optional, some of your personal data (name, last name, city, email address) will be processed by **T.G.E. VENTILATORI S.r.l.** for marketing purposes, surveys and sending of commercial communications via mail, email, telephone, fax or any other means of communication at distance, in relation to goods or services offered by the same **T.G.E. VENTILATORI S.r.l.** or by third parties.

   The provision of such personal data and consent to their use for this purpose is free and optional, however any refusal will not enable you to use the warranty services.

   We remind you that, even in case of a consensus, you can oppose at any time to the processing of your personal data for such purposes, and you can exercise all the rights under Art. 7 of the Code by simple request to **T.G.E. VENTILATORI S.r.l.** without any formalities.

3. **Method of treatment**

   In relation to the above purposes, the processing of data will be done both through computer and/or electronic devices, than on paper and, anyway, through instruments suitable to guarantee security and confidentiality through the adoption of security measures required by the Code. Please note that your personal information will be kept at the registered office of the data controller or third-party companies that offer so-called "hosting" services, which, in that case, will be appointed as responsible for external treatment.

4. **Communication and diffusion of data**

   Be aware that the subjects named by **T.G.E. VENTILATORI S.r.l.** will manage your personal data such as "data processors" or "processors". Your personal information will not be disseminated in any way by **T.G.E. VENTILATORI S.r.l.**

5. **Owner and manager of the treatment**

   The holder of the treatment is **T.G.E. VENTILATORI S.r.l.**, Via Francesco Noè, 9/11-20080 BUBBIANO (MI) Italy. The data controller is Mr. Gianluca Torrente. You may obtain a complete list of the data processors appointed by **T.G.E. VENTILATORI S.r.l.** contacting **T.G.E. VENTILATORI S.r.l.** without any formality, using contact details listed above.

6. **Rights referred to Art. 7 of the Code**

   The subjects to whom the personal data refer have the right at any time to obtain confirmation of the existence or otherwise of such data and to know its content and origin, verify its accuracy or request its integration or updating, or rectification (art. 7 of the Code).

   For the purposes of this Article shall have the right to request cancellation, transformation into anonymous form or blocking of the data processed in violation of the law, and oppose any case, for legitimate reasons, to their treatment. Requests should be addressed to the data controller, as above better identified, without any formality.

WARRANTY REGISTRATION FORM

COMPANY:	
Address:	
Name:	
Last name:	
Role:	

All information requested below can easily be found on the name plate of the fan.

Type:		Orientation:	
Arrangement:		Production year:	
serial Nr:		Job. No°	
ITEM:			

I consent to the processing of personal data pursuant to art. 13 of (Italian) Legislative Decree No 30 June 2003. 196 - "Code for the Protection of Personal Data"

Signature: _____ .

___/___/20_____ .

Cut along the dotted line

20.2. ATTACHMENT 2 – QUANTITY OF GREASE RECOMMENDED FOR FILLING THE BEARINGS

Alternatively, to determine the amount of grease required for relubrication can adopt the following relation:

$$P = G \times B \times c$$

Where G is the diameter of the bearing expressed in [mm], B is the width of the bearing in [mm] and c the coefficient determined by the graph of figure 19.

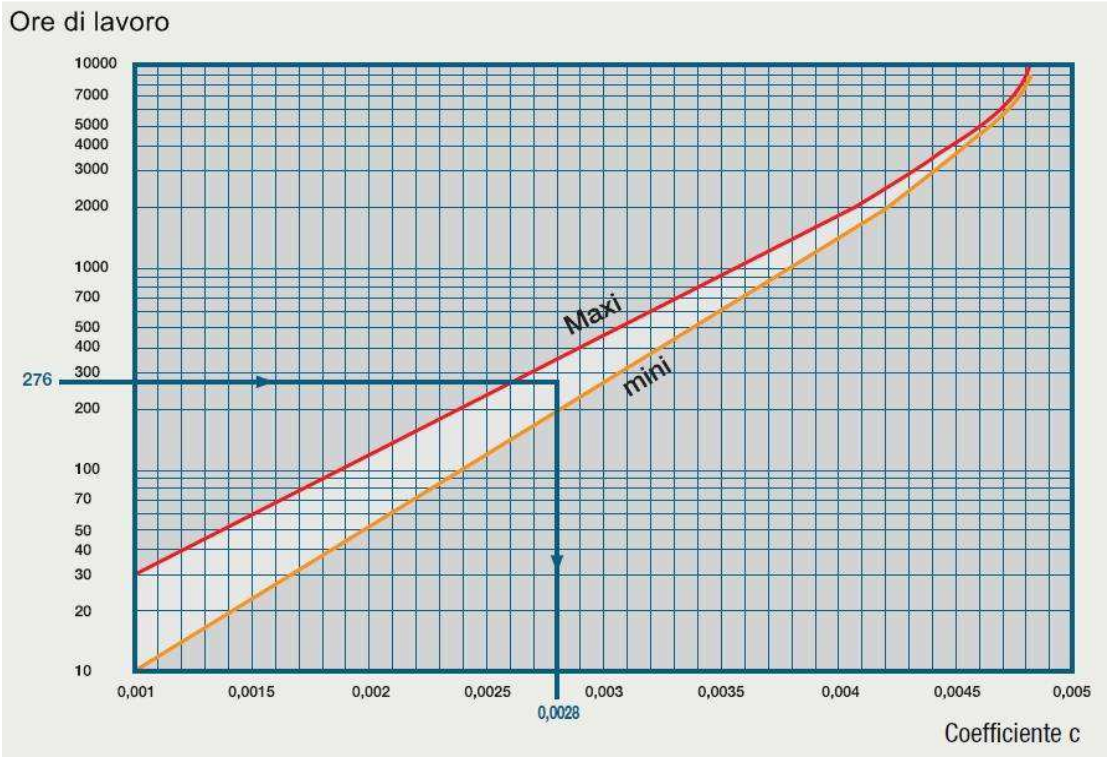
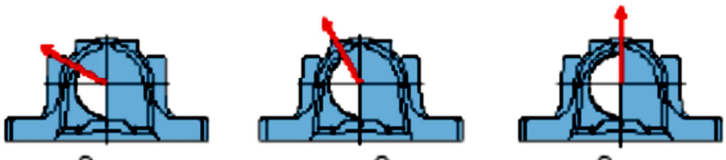


Figure 19 *Coefficient c as a function of working hours of the bearing.*

20.3. ATTACHMENT 3 – TIGHTENING COUPLINGS FOR MOUNTING BOLTS ON BEARINGS BASE



Corpo	Viti del cappello								Bulloni di fissaggio	
Tipo	Carico di snervamento per entrambe le viti			Carico massimo per entrambe le viti			Coppia di serraggio	Appellativo sec. EN 24014	Tipo	Coppia di serraggio
	$Q_{120°}$	$Q_{150°}$	$Q_{180°}$	$F_{120°}$	$F_{150°}$	$F_{180°}$				
-	kN			kN			Nm	-	-	Nm
SNL 205	155	95	70	60	60	52	50	M 10x40	M 12	90
SNL 206-305	170	85	75	50	30	25	50	M 10x40	M 12	90
SNL 207	190	85	75	50	30	25	50	M 10x50	M 12	90
SNL 208-307	215	85	75	50	30	25	50	M 10x50	M 12	90
SNL 209	230	85	75	50	30	25	50	M 10x50	M 12	90
SNL 210	265	85	75	50	30	25	50	M 10x55	M 12	90
SNL 211	275	125	110	80	45	40	80	M 12x60	M 16	220
SNL 212	300	125	110	80	45	40	80	M 12x60	M 16	220
SNL 213	340	125	110	80	45	40	80	M 12x65	M 16	220
SNL 215	410	125	110	80	45	40	80	M 12x65	M 16	220
SNL 216	430	125	110	80	45	40	80	M 12x70	M 20	430
SNL 217	480	125	110	80	45	40	80	M 12x80	M 20	430
SNL 218	550	230	200	170	100	85	150	M 16x90	M 20	430
SNL 505	155	85	75	50	30	25	50	M 10x40	M 12	90
SNL 506-605	170	85	75	50	30	25	50	M 10x40	M 12	90
SNL 507-606	190	85	75	50	30	25	50	M 10x50	M 12	90
SNL 508-607	215	85	75	50	30	25	50	M 10x50	M 12	90
SNL 509	230	85	75	50	30	25	50	M 10x50	M 12	90
SNL 510-608	265	85	75	50	30	25	50	M 10x55	M 12	90
SNL 511-609	275	125	110	80	45	40	80	M 12x60	M 12	220
SNL 512-610	300	125	110	80	45	40	80	M 12x60	M 12	220
SNL 513-611	340	125	110	80	45	40	80	M 12x65	M 12	220
SNL 515-612	410	125	110	80	45	40	80	M 12x65	M 12	220
SNL 516-613	430	125	110	80	45	40	80	M 12x70	M 12	430
SNL 517	480	125	110	80	45	40	80	M 12x80	M 12	430
SNL 518-615	550	230	200	170	100	85	150	M 16x90	M 20	430
SNL 519-616	580	230	200	170	100	85	150	M 16x90	M 20	430
SNL 520-617	620	360	310	260	150	130	200	M 20x100	M 24	750
SNL 522-619	680	360	310	260	150	130	200	M 20x100	M 24	750
SNL 524-620	790	360	310	260	150	130	200	M 20x110	M 24	750
SNL 526	900	500	450	380	220	190	350	M 24x130	M 24	750
SNL 528	1 050	500	450	380	220	190	350	M 24x130	M 30	1 400
SNL 530	1 200	500	450	380	220	190	350	M 24x130	M 30	1 400
SNL 532	1 450	500	450	380	220	190	350	M 24x130	M 30	1 400

20.4. ATTACHMENT 4 – PULLEYS ALIGNMENT

The cause of the noise coming from the V belt drive or premature failure of the same is often formed by the misalignment of the pulleys. Most frequent errors are the angular misalignment, parallel misalignment and combined misalignment all reported figure 20.

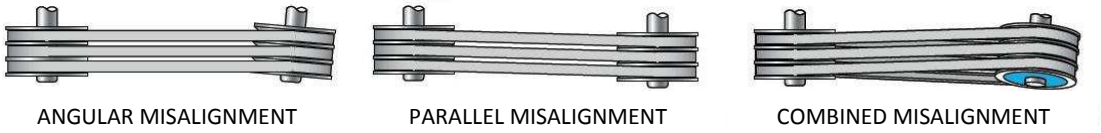
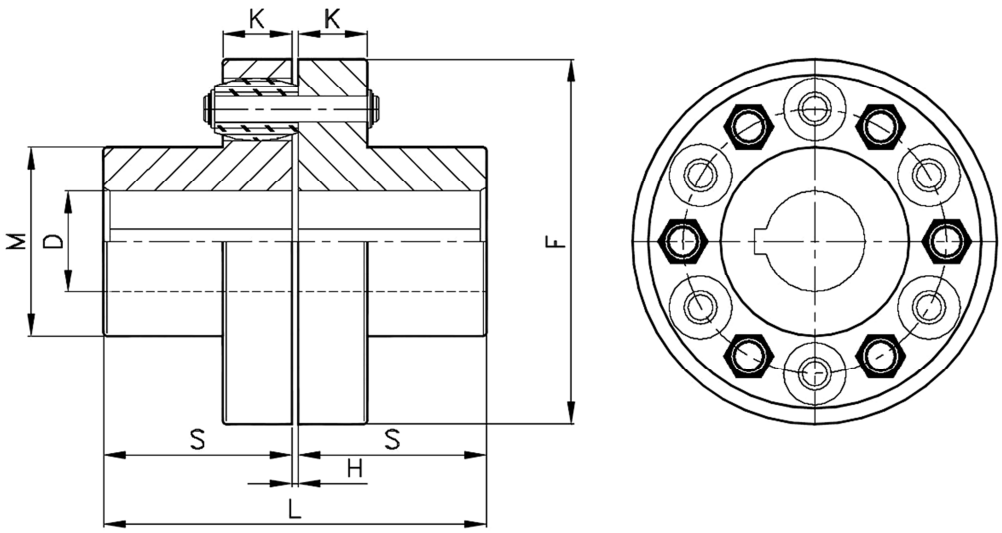


Figure 20 *Types of misalignment of the pulleys.*

These forms of improper placement can be easily detected with the laser diagnostic instrumentation, Figure 21, and corrected by acting on the appropriate adjustment screws.

Figure 21 *Diagnostic instrumentation for the alignment of the pulleys.*

20.5. ATTACHMENT 5 – JOINTS TABLE



Tipo Type	Mt Nom. Kgm	D max	Foro grezzo	N/n HP/giri	F	L	H	K	M	S	PD² Kgm²	Peso Kg	N. PERNI	Giri max.
E 100 P	22	32	-		100	123	3	20	55	60	0.019	4,5	8	6050
E 120 P	35	45	-	0,048	120	143	3	20	71	70	0,021	6	10	6000
E 140 P	60	55	-	0,083	140	163	3	20	85	80	0,062	9	14	5300
E 160 P	90	60	-	0,125	160	183	3	20	102	90	0,11	14	16	4500
E 180 P	130	65	-	0,182	180	204	4	25	103	100	0,17	17	12	4000
E 200 P	180	75	-	0,251	200	234	4	25	118	115	0,35	27	14	3600
E 225 P	260	90	40	0,363	225	264	4	25	145	130	0,92	47	16	3200
E 250 P	460	95	45	0,642	250	305	5	38	147	150	1,29	55	14	3000
E 300 P	650	110	50	0,907	300	365	5	38	182	180	2,87	85	16	2500
E 350 P	1050	120	60	1,466	350	406	6	60	200	200	5,33	130	12	2200
E 400 P	1450	140	70	2,025	400	446	6	60	232	220	12,31	190	14	1800
E 450 P	2100	160	75	2,930	445	487	7	72	253	240	21,30	260	12	1600
E 500 P	2800	180	75	3,911	495	527	7	72	288	260	36,50	350	14	1400
E 550P	3600	210	80	5,027	545	567	7	72	322	280	60,00	450	16	1200

20.6. ATTACHMENT 6 – BELT TIGHTENING

The motor fixing system has been designed in order to provide the assembly/disassembly the transmission belts, the tensioning and the compensation of the stretching that occurs during normal operation (estimated in the order of 1 to 2% of the length of the belt). Then it is been provided the possibility to vary the span between the driving pulley and the driven pulley of at least -1.5% and +3% Li, where Li is the internal length of the belt under the nominal assembly tension.

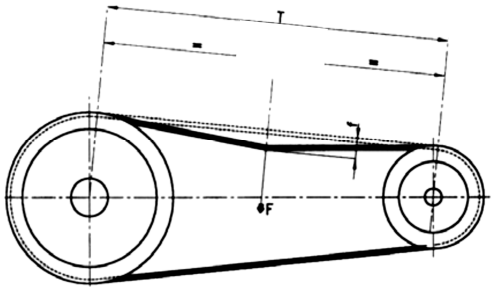


Figure 22 *Scheme for tensioning of the transmission belts.*

The proper functioning of the belt is subject to the right assembly tension of the belts themselves then check the tension as follows:

- Measure the T span length;
- Apply, in the center of the free section T via STYLOTESTER or dynamometer, a force F sufficient to deflect the belt so as to form an arrow f of 1.6 [mm] for each 100 [mm] in length of the free section Li figure 20;
- Check the value of F with the values of F 'and F'' shown in Table 4.

Belt Section	Minor Pulley external diameter [mm]	Minor pulley RPM	F'_{min} [N]	F'_{Max} [N]
SPZ	50 ÷ 90 100 ÷ 150 155 ÷ 180	1200 ÷ 5000 900 ÷ 1800 600 ÷ 1200	10 20 25	15 30 35
SPA	90 ÷ 145 150 ÷ 195 200 ÷ 250	900 ÷ 1800 600 ÷ 1200 400 ÷ 900	25 30 35	35 45 50
SPB	170 ÷ 235 250 ÷ 320 330 ÷ 400	900 ÷ 1800 600 ÷ 1500 400 ÷ 900	35 40 45	45 60 65
SPC	250 ÷ 320 330 ÷ 400 440 ÷ 520	900 ÷ 1800 600 ÷ 1200 400 ÷ 900	70 80 90	100 115 130

Table 4 *Table for the correct tensioning of the transmission belts.*

The table is related to transmissions with ratios from two to four. For F <F ', will need to tighten the belt again. For F> F 'the belt is too tight.

WARNING:

In the breaking-in period of the transmissions occurs a rapid decrease in tension. It is therefore necessary during assembly to tension the belts in such a way that the force f which generates the arrow f is 1.3 times higher than that indicated in the table.